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(54) **SYSTEMS AND METHODS FOR RECEIVING PACKAGES DELIVERED BY UNMANNED VEHICLES**

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| *B64D 1/22* | (2006.01) |
| *B64D 1/02* | (2006.01) |
| *B65D 5/36* | (2006.01) |
| *B65D 25/00* | (2006.01) |

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USPC ....................................... 705/330; 232/20–21
See application file for complete search history.

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(57) **ABSTRACT**

An apparatus for receiving a package delivered by an unmanned aerial vehicle comprises a collapsible package receiver adapted to be movably coupled to a building. The collapsible package receiver is configured to be placed from a collapsed position to a pop-out position to receive the package from the unmanned aerial vehicle. The apparatus has a memory associated with the package receiver which stores computer-readable instructions. A processor is configured to execute the instructions to: (a) determine a characteristic of the package delivered by the unmanned aerial vehicle to the package receiver; and (b) notify a user of the delivery of the package.

**20 Claims, 16 Drawing Sheets**
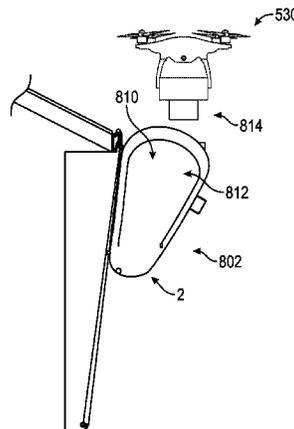
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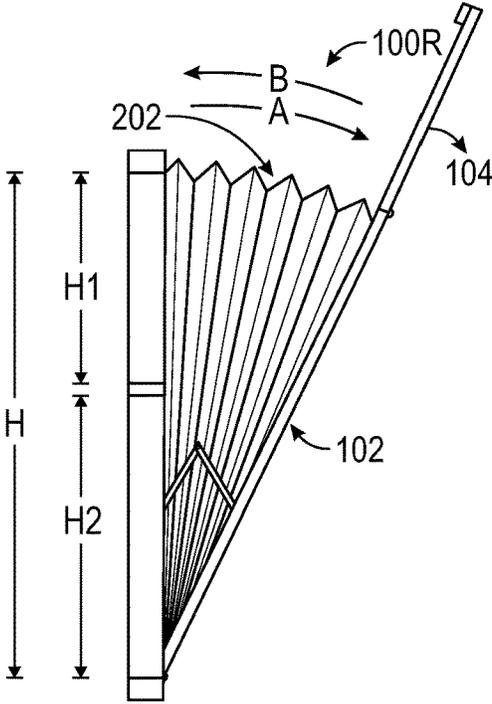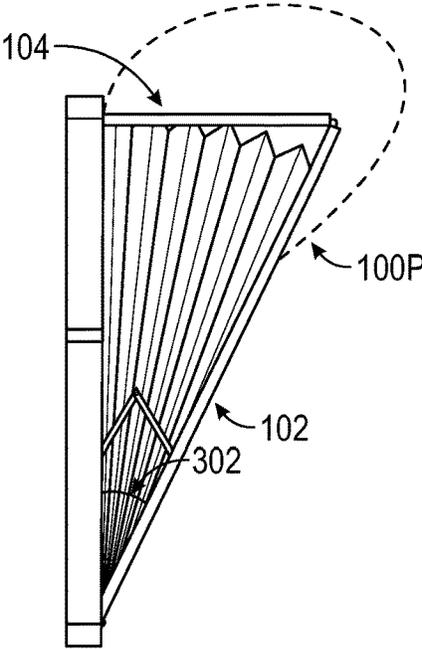
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FIG. 1

FIG. 2

FIG. 3
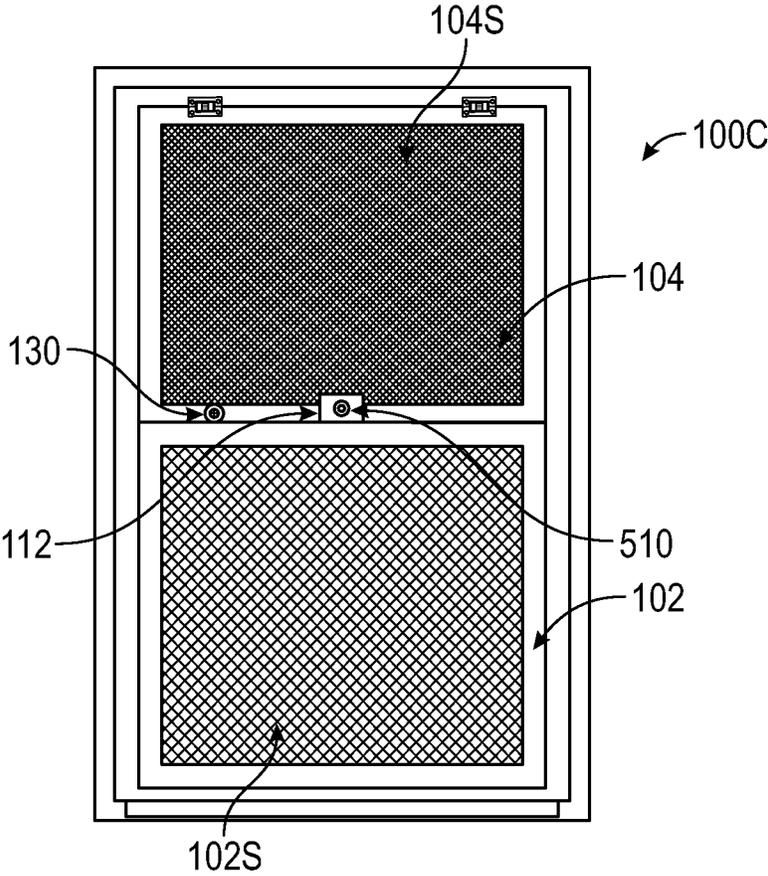
**FIG. 4**
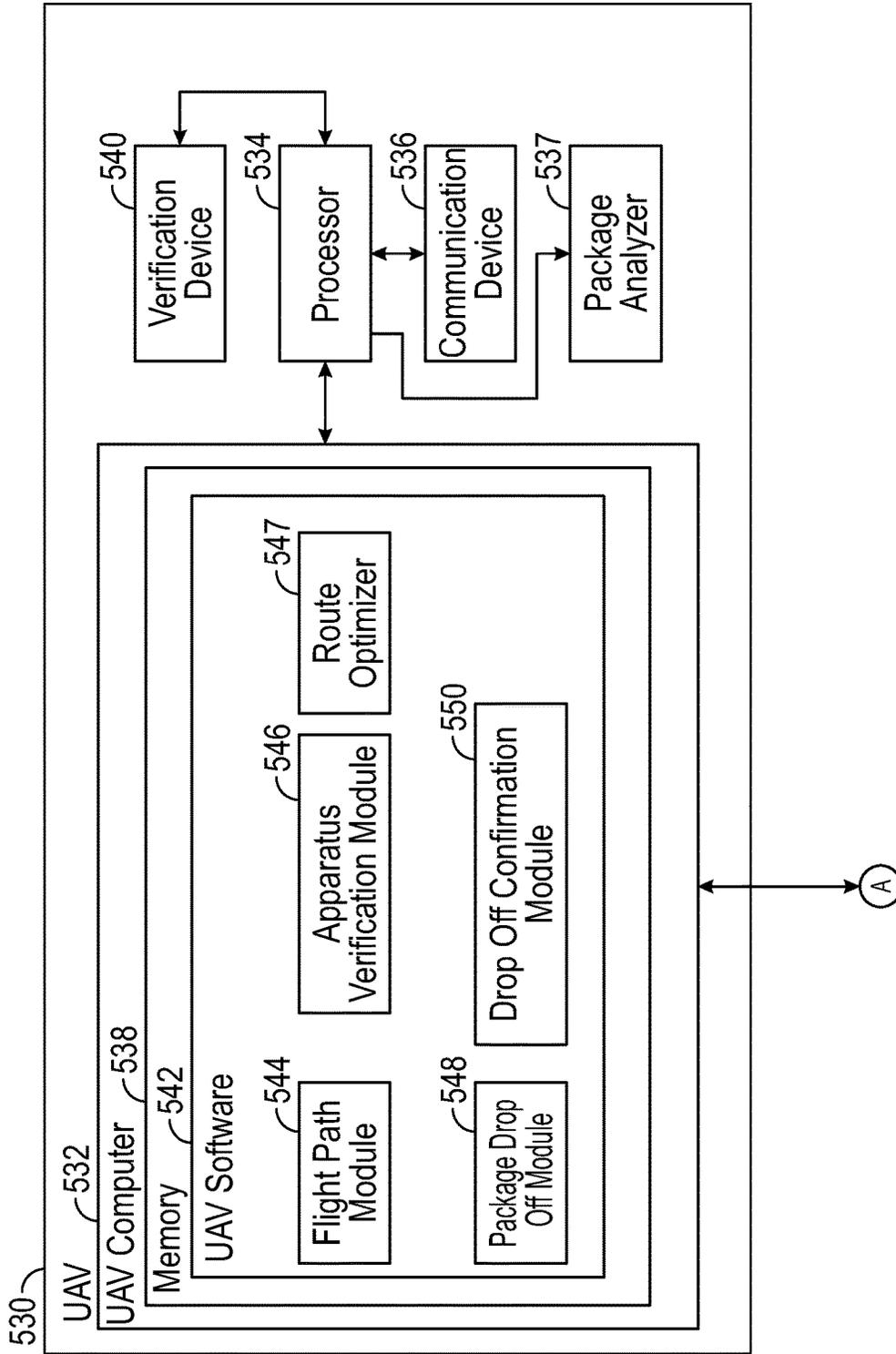
FIG. 5A
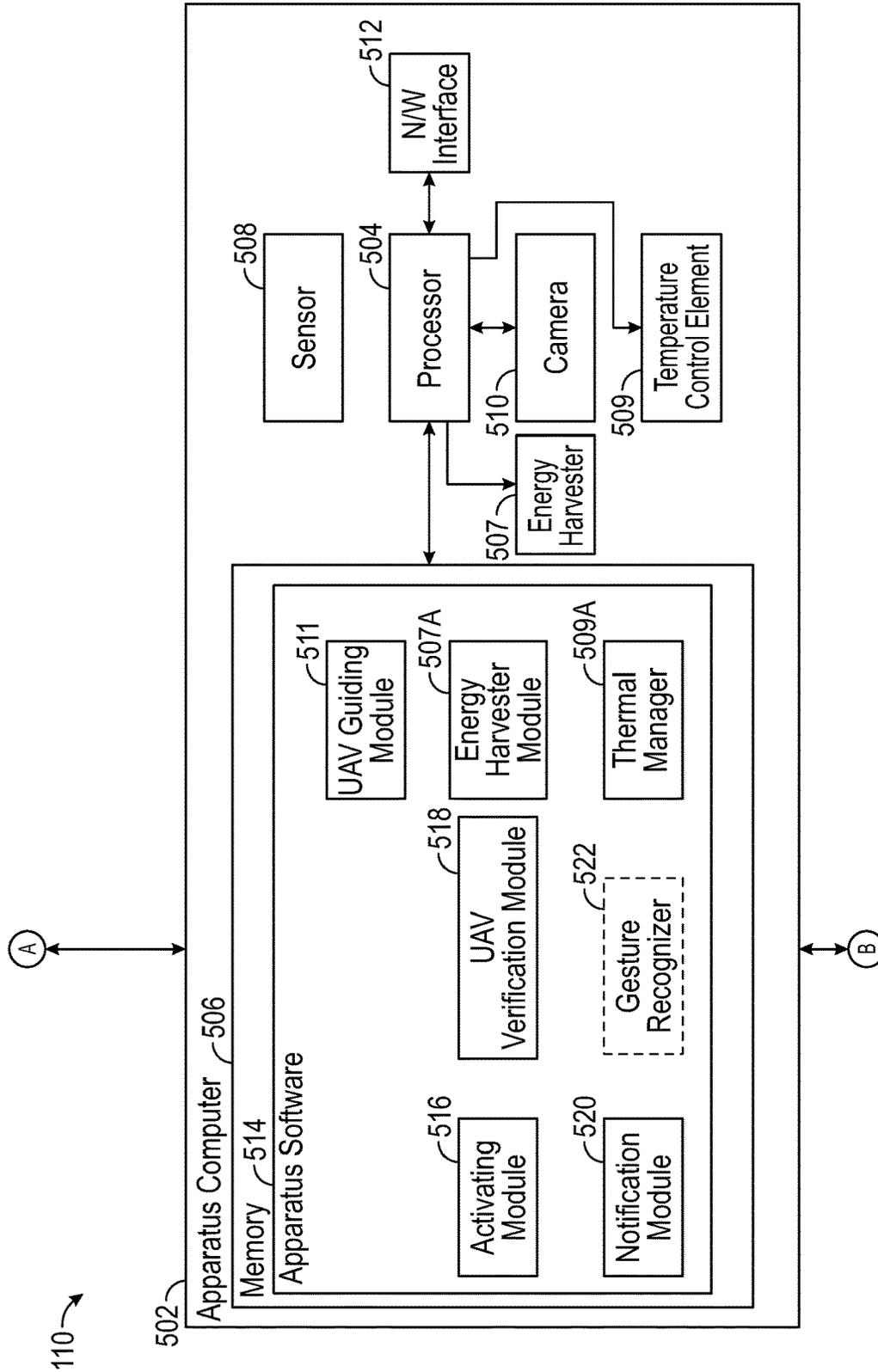
FIG. 5B

FIG. 5C

FIG. 6A



FIG. 6B

FIG. 6C

**FIG. 7A**



**FIG. 7B**

8020

822

817

FIG. 8B

800

804A

806

806A

807

808

802C

802

809

804B

10

FIG. 8A

530

814

812

802

2

810

**FIG. 8D**

802R

803A

802

806A
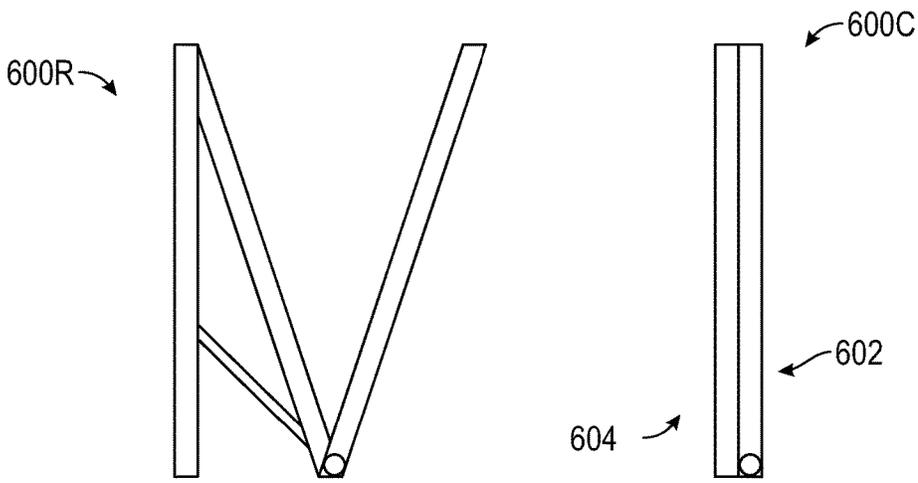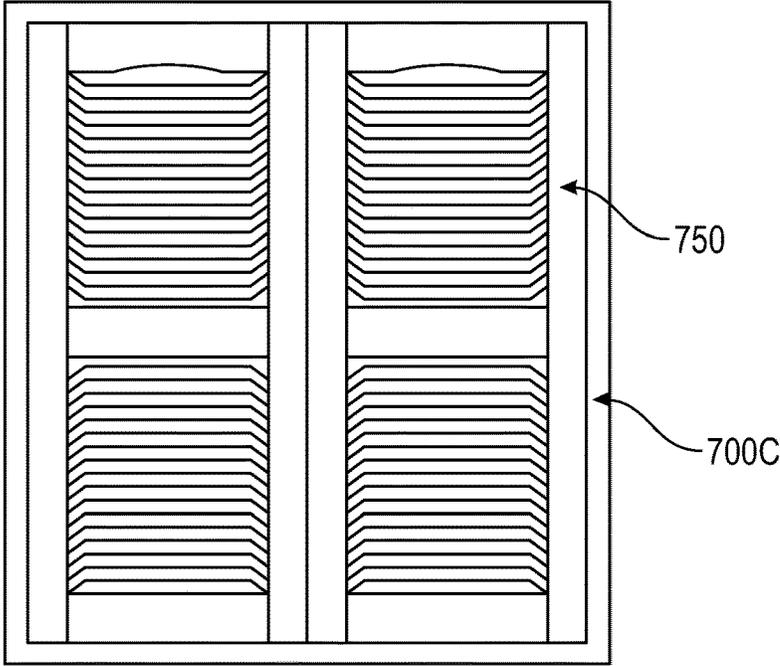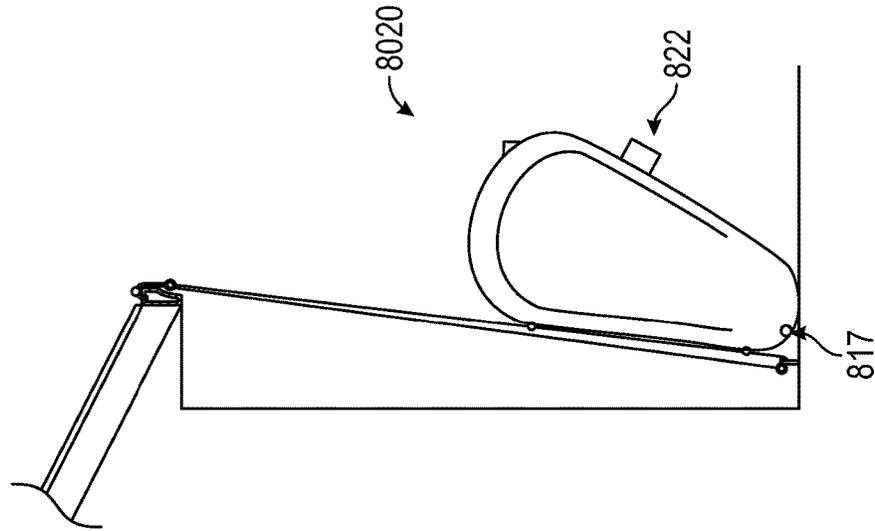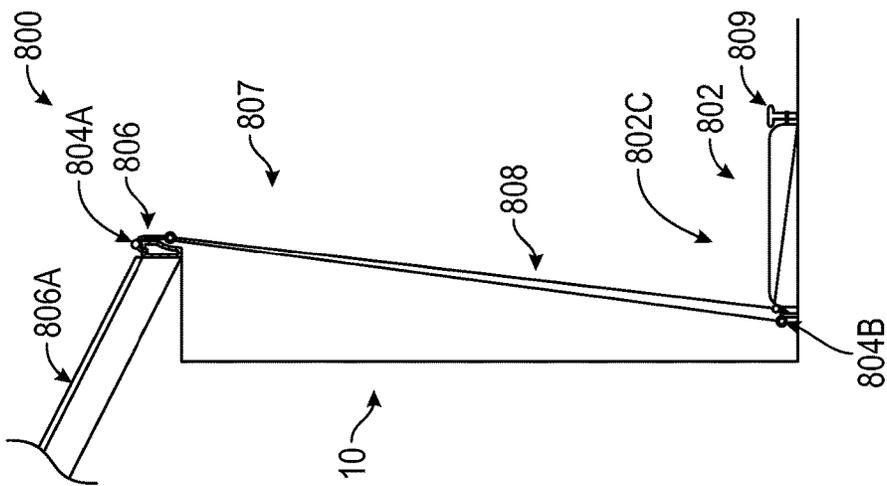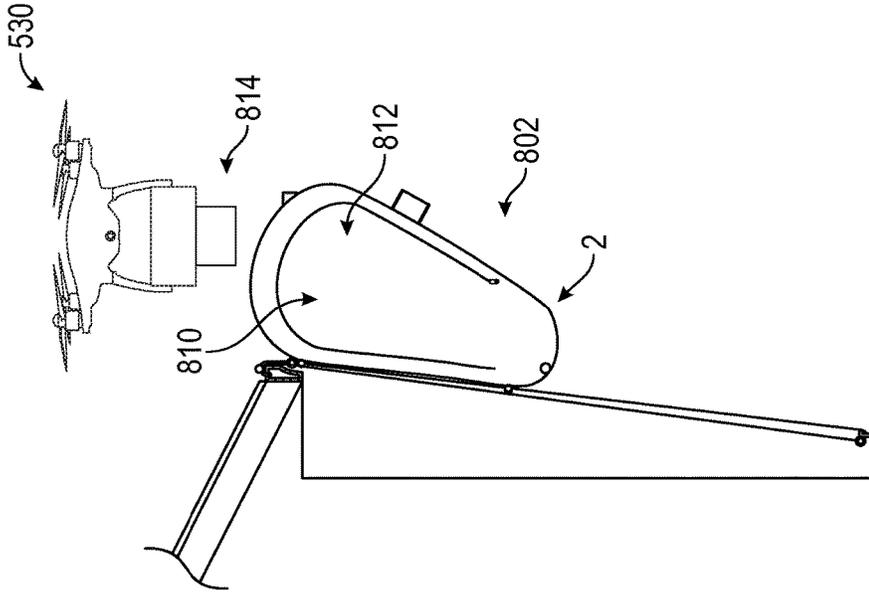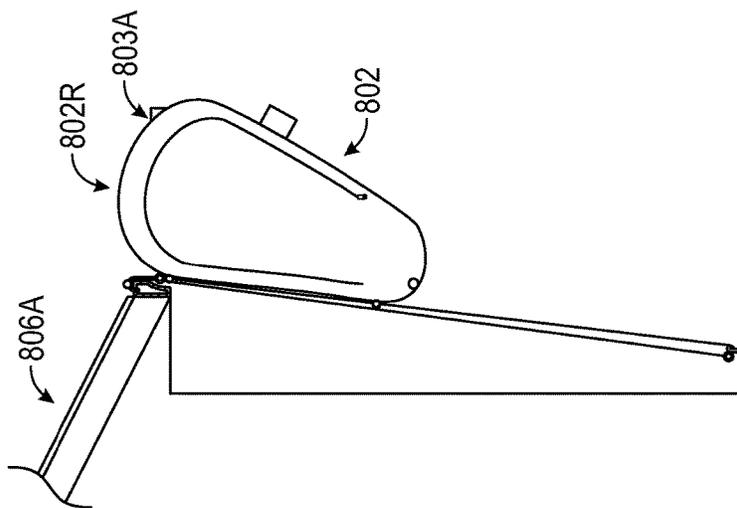
**FIG. 8C**

FIG. 8E

FIG. 9

FIG. 10

FIG. 11B



FIG. 11A

FIG. 12

1300 ⟶

**1302**
USER POPS-OUT THE PACKAGE RECEIVER 802

↓

**1304**
USER 560 USES ELEVATING MEANS 807 TO HOIST THE RECEIVER 802

↓

**1306**
UAV 530 EMPLOYS FLIGHT PATH MODULE 544 AND ROUTE OPTIMIZER 547 TO FLY TO A LOCATION PROXIMATE THE RECEIVER 802

↓

**1308**
APPARATUS VERIFICATION MODULE 546 OF UAV 530 AUTHENTICATES THE APPARATUS 800

↓

**1310**
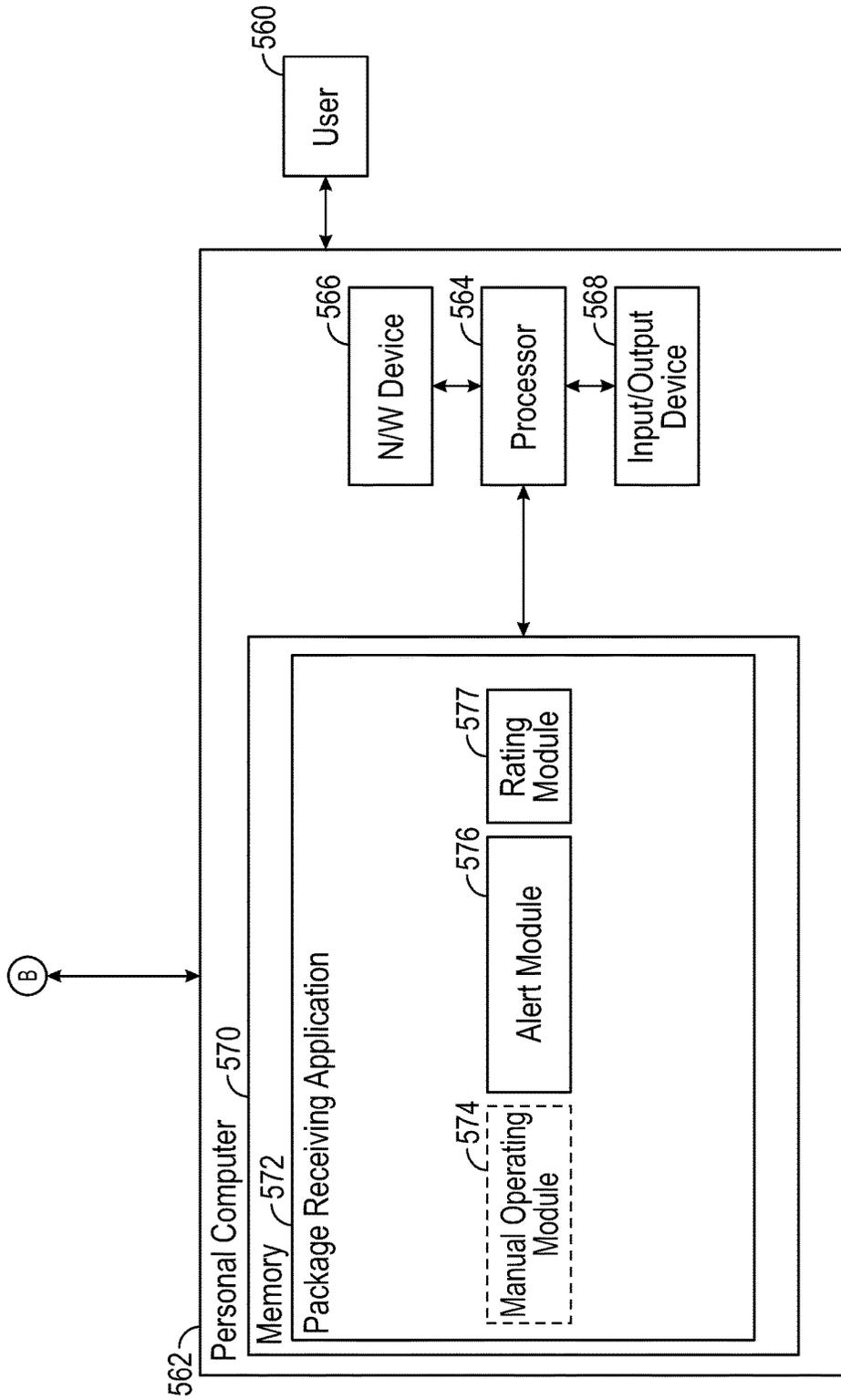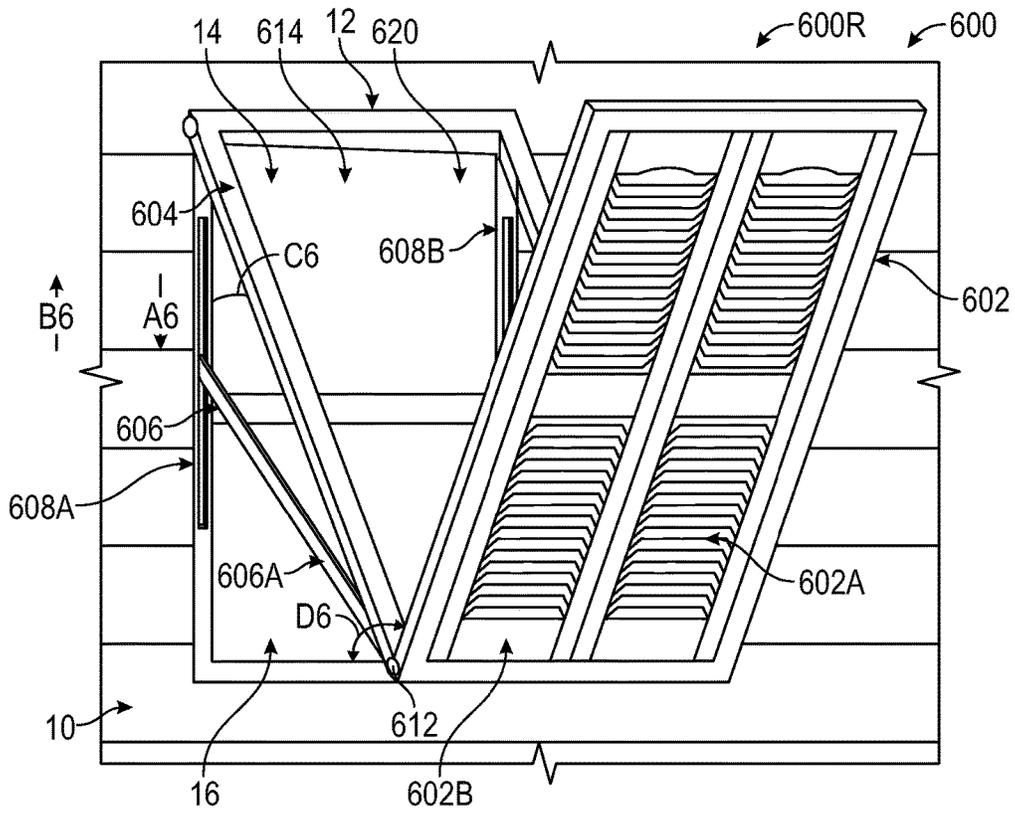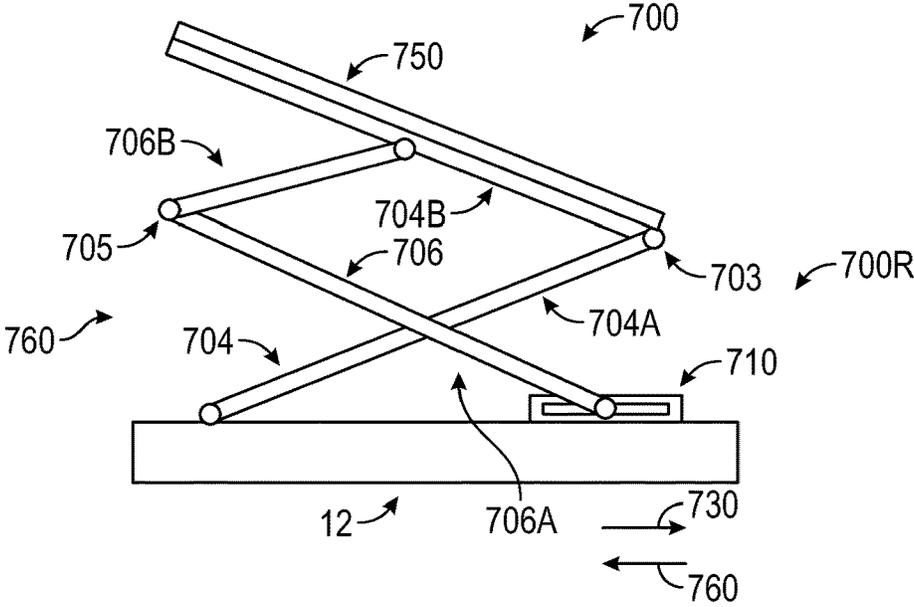UAV VERIFICATION MODULE 906 OF APPARATUS 800 AUTHENTICATES UAV 530

↓

**1312**
UAV GUIDING MODULE 911 GUIDES THE UAV 530 TO THE APPARATUS 800

↓

**1314**
PACKAGE DROP OFF MODULE 548 CAUSES UAV 530 TO DROP OFF PACKAGE 514 IN THE PACKAGE RECEIVING AREA 810

↓

**1316**
SENSOR 916 DETERMINES AT LEAST ONE CHARACTERISTIC C OF THE PACKAGE 814

**1318**
RECEIVER COMPUTER 902 TAKES AN ACTION BASED ON THE DETERMINED CHARACTERISTIC C

↓

**1320**
NOTIFICATION MODULE 910 COMMUNICATES WITH THE PERSONAL COMPUTER 502 TO CAUSE THE ALERT MODULE 576 TO APPRISE THE USER 560 ABOUT DELIVERY OF THE PACKAGE 814

↓

**1322**
USER 560 USES ELEVATING MEANS 807 TO LOWER THE PACKAGE RECEIVER 802

↓

**1324**
USER 560 OPENS PACKAGE RECEIVER 802 AND RETRIEVES PACKAGE 814

↓

**1326**
USER 560 COLLAPSES THE PACKAGE RECEIVER 802 FOR STORAGE

↓

**1328**
USER 560 USES RATING MODULE 577 TO RATE THE PACKAGE DELIVERY

FIG. 13

# SYSTEMS AND METHODS FOR RECEIVING PACKAGES DELIVERED BY UNMANNED VEHICLES

## FIELD OF THE DISCLOSURE

The disclosure relates generally to the field of package receiving systems and methods. More specifically, the disclosure relates to systems and methods for receiving packages delivered by drones and other unmanned vehicles.

## SUMMARY

The following presents a simplified summary of the disclosure in order to provide a basic understanding of some aspects of the disclosure. This summary is not an extensive overview of the disclosure. It is not intended to identify critical elements of the disclosure or to delineate the scope of the disclosure. Its sole purpose is to present some concepts of the disclosure in a simplified form as a prelude to the more detailed description that is presented elsewhere.

According to an embodiment, an apparatus for receiving a package delivered by an unmanned aerial vehicle comprises a collapsible package receiver adapted to be movably coupled to a building. The collapsible package receiver is configured to be placed from a collapsed position to a pop-out position to receive the package from the unmanned aerial vehicle. The apparatus has a memory associated with the package receiver which stores computer-readable instructions. A processor is configured to execute the instructions to: (a) determine a characteristic of the package delivered by the unmanned aerial vehicle to the package receiver; and (b) notify a user of the delivery of the package.

According to another embodiment, a method for receiving a package delivered by an unmanned aerial vehicle comprises the step of providing a pop-up package receiver. The method inclu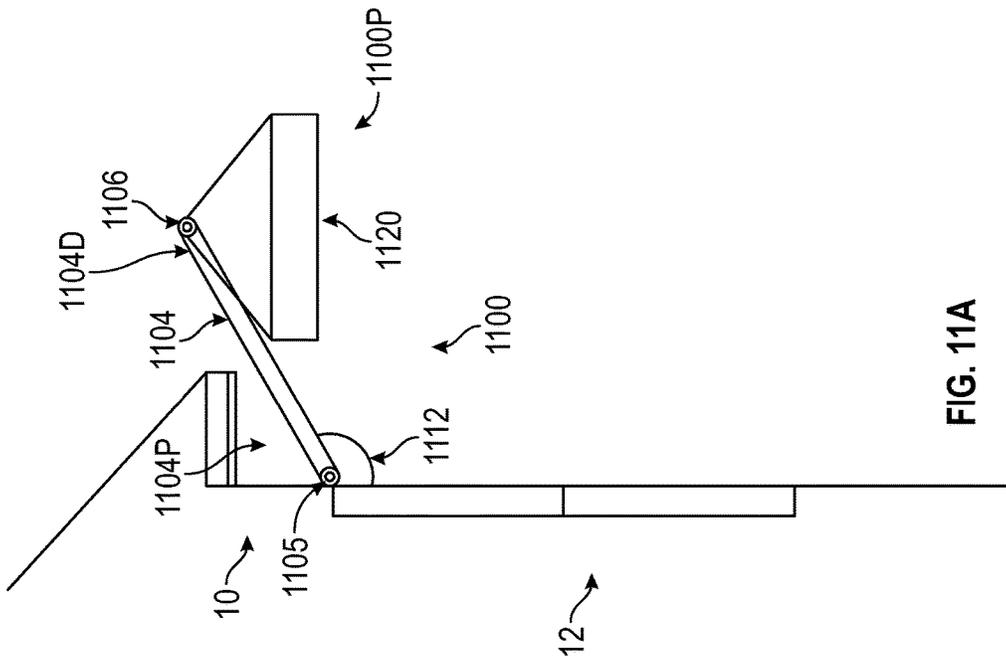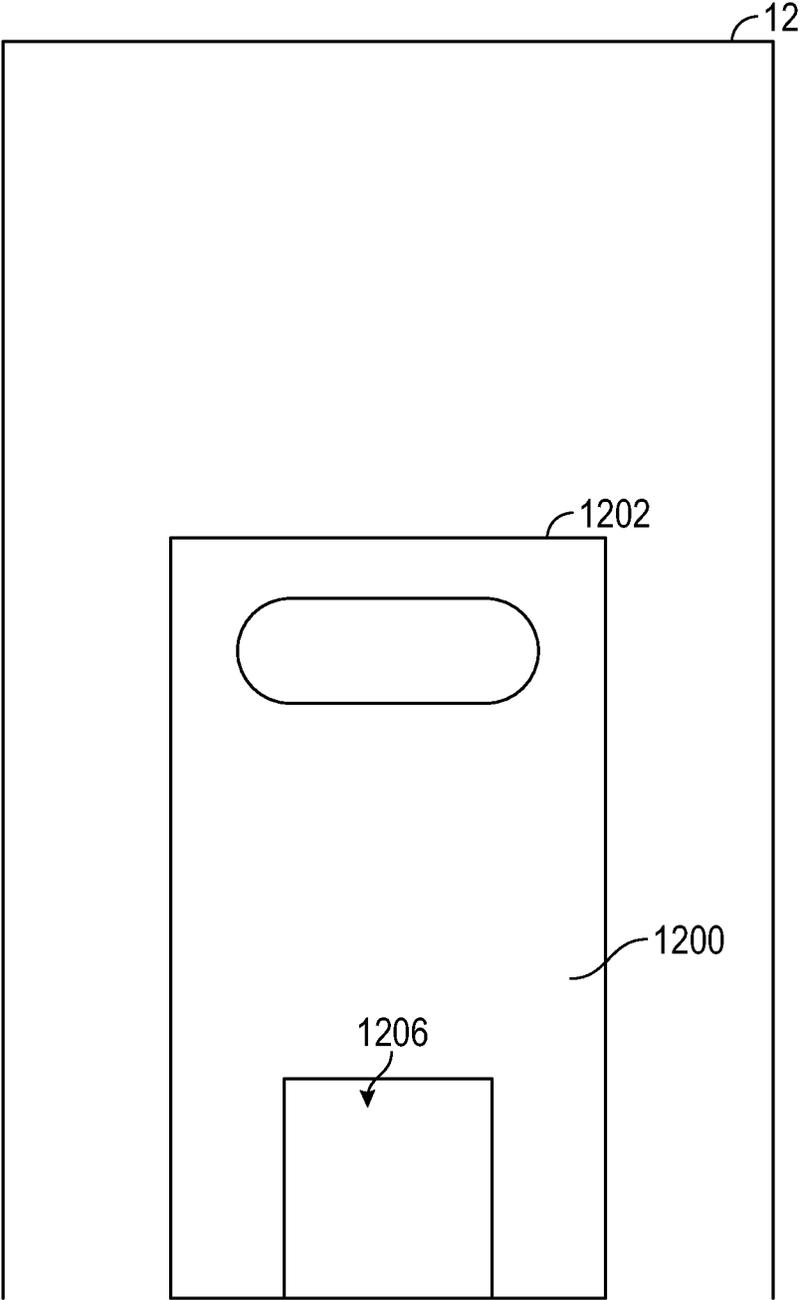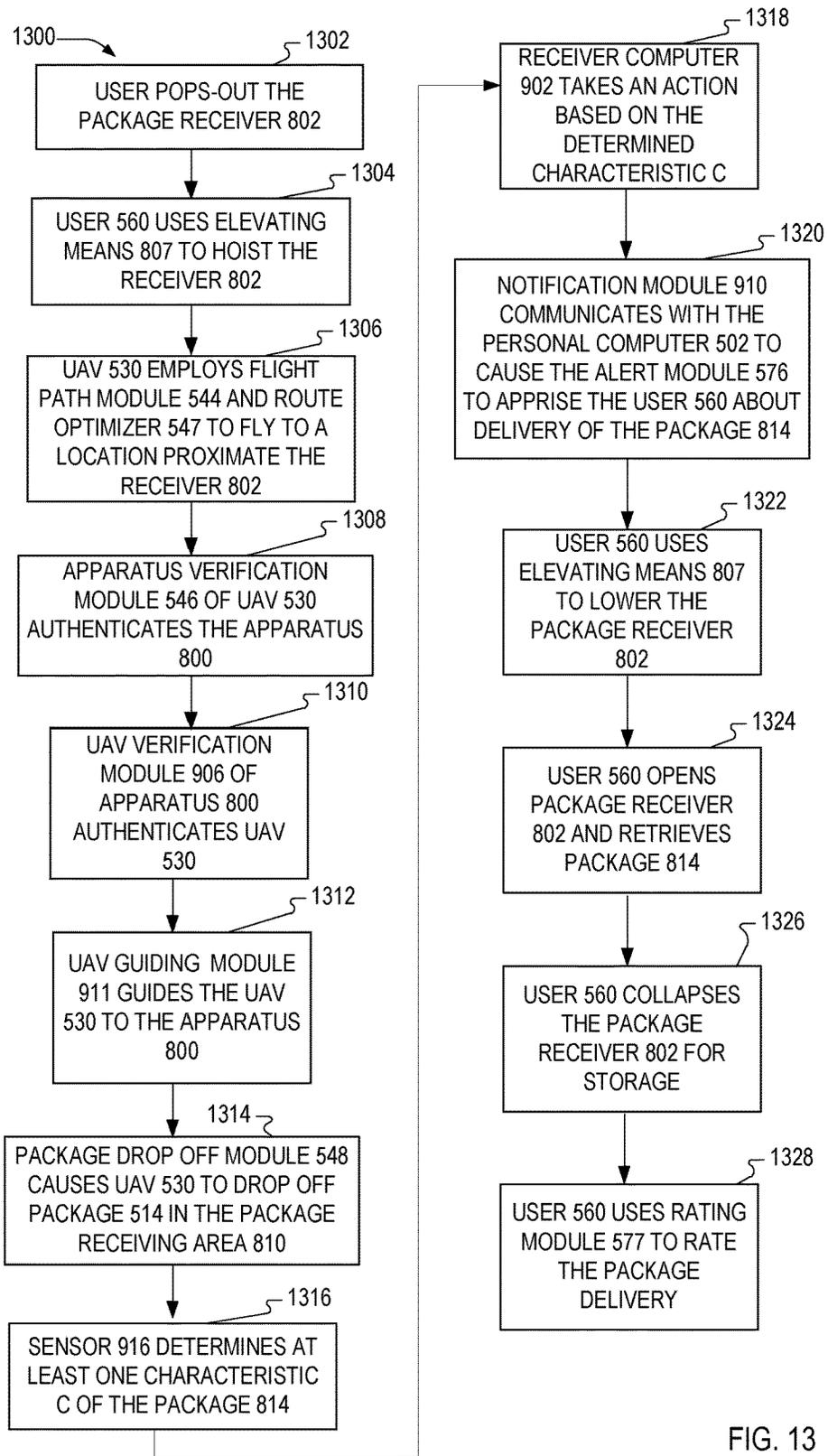des movably coupling the pop-up package receiver to a building, and placing the package receiver in a pop-out position. The method comprises raising the package receiver along the building to receive the package. The method includes lowering the package receiver after the package is received to retrieve the package from the package receiver.

According to yet another embodiment, a method for receiving a package delivered by an unmanned aerial vehicle comprises the step of providing a pop-up package receiver. The package receiver has a package receiving area and a sensor to determine at least one characteristic of the package. The package receiver includes a memory having computer-readable instructions stored thereon. The processor is configured to execute the instructions to: (a) wirelessly communicate with the unmanned aerial vehicle to authenticate the unmanned aerial vehicle; and (b) determine at least one characteristic of the package upon the delivery of the package to the package receiver. The method includes movably coupling the package receiver to a gutter of a building. The method comprises placing the package receiver from a collapsed position to an open position such that the package receiving area is accessible to the unmanned aerial vehicle. The method includes receiving the package in the package receiving area, and retrieving the package from the package receiving area. The method comprises placing the package receiver in the collapsed position upon retrieval of the package.

## BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

Illustrative embodiments of the present disclosure are described in detail below with reference to the attached drawing figures and wherein:

FIG. 1 is a perspective view of a package receiving apparatus, according to an embodiment;

FIG. 2 is a side view of the package receiving apparatus of FIG. 1 and shows the apparatus in a package receiving position;

FIG. 3 is another side view of the package receiving apparatus of FIG. 1 and shows the apparatus in a package securing position;

FIG. 4 is a front view of the package receiving apparatus of FIG. 1 and shows the apparatus in a closed position;

FIGS. 5A-5C schematically illustrate electronics associated with the package receiving apparatus of FIG. 1 and the communication thereof with a user device and an unmanned aerial vehicle;

FIG. 6A is a perspective view illustrating another embodiment of the package receiving apparatus of FIG. 1;

FIG. 6B is a side view of the package receiving apparatus of FIG. 6A showing the apparatus in a package receiving position;

FIG. 6C is another side view of the package receiving apparatus of FIG. 6A showing the apparatus in a closed position;

FIG. 7A is a top view illustrating another embodiment of the package receiving apparatus of FIG. 1 and shows the apparatus in a package receiving position;

FIG. 7B is a side view of the package receiving apparatus of FIG. 7A and shows the apparatus of FIG. 7A in a closed position;

FIG. 8A is a side view of another embodiment of the package receiving apparatus of FIG. 1 and shows the apparatus in a collapsed position;

FIG. 8B is another side view of the apparatus of FIG. 8A and shows the apparatus in an open position;

FIG. 8C is another side view of the apparatus of FIG. 8A and shows the apparatus in a package receiving position;

FIG. 8D is yet another side view of the apparatus of FIG. 8A and shows the apparatus receiving a package from an unmanned aerial vehicle;

FIG. 8E is yet another side view of the apparatus of FIG. 8A and shows an openable section therein having been opened to retrieve a package;

FIG. 9 schematically illustrates electronics associated with the package receiving apparatus of FIGS. 8A-8E and the communication thereof with other devices;

FIG. 10 shows a side view of another embodiment of the package receiving apparatus of FIGS. 8A-8E;

FIG. 11A shows a side view of another embodiment of the package receiving of FIGS. 8A-8E, and illustrates the apparatus in a package receiving position;

FIG. 11B shows a side view of the package receiving apparatus of FIG. 11A, and shows the apparatus in a package delivering position.

FIG. 12 shows a front view of yet another embodiment of the package receiving apparatus of FIGS. 8A-8E.

FIG. 13 shows a flowchart illustrating an example method of using the package receiving apparatus of FIGS. 8A-8E.

## DETAILED DESCRIPTION

Delivering packages from senders to recipients is an age old practice. Packages were initially delivered to recipients

by package couriers on horses. Over time, as technology evolved, the couriers began using steamboats, locomotives, planes, road vehicles, etc., to deliver a package from a sender to a recipient remote from the sender. More recently, companies like Amazon, UPS, 7-Eleven, and others, are developing and investing in technologies that would allow unmanned vehicles (e.g., unmanned aerial vehicles or "drones", such as tricopters, quadcopters, octocopters, etc.) to deliver packages to the intended recipients. These technologies, once implemented on a large scale, may desirably reduce the costs, labor, and time it takes to deliver a package from one location to another. Delivering packages using unmanned aerial vehicles also presents a new host of challenges, however. For example, if an unmanned aerial vehicle flies down to the door of the abode of a recipient to drop off a package, the unmanned aerial vehicle may crash with a person who happens to be present in the area (or crash with an object), thereby injuring the person and/or damaging the aerial vehicle. Furthermore, dropping off packages outside the doors of the respective recipients' abodes may be undesirable because the dropped off packages (and the unmanned aerial vehicles themselves) may be susceptible to theft. It may be desirable to have in place systems that allow for: (a) unmanned aerial vehicles to drop off packages for recipients without coming proximate (e.g., within ten feet) of the ground; and/or (b) packages delivered by unmanned aerial vehicles to be securely stored until they are retrieved by the intended recipients. The present disclosure relates, at least in part, to such systems, and to methods of making and using these systems.

FIG. 1 shows a package receiving apparatus 100 according to an example embodiment. The package receiving apparatus 100 may be adapted to receive and secure one or more packages delivered by unmanned aerial vehicle(s). The illustrated apparatus 100 is configured proximate a window 12 of a building 10. The building 10 may be an apartment building (such as a high-rise or other apartment building), a house, an office building, or other such structure, and may have more than one apparatus 100 operably coupled thereto (e.g., the building 10 may have a plurality of windows 12 and several windows 12 may each have an apparatus 100 associated therewith). The window 12 may be opened from within the building 10 to allow an intended recipient of a package to access the package receiving apparatus 100 and retrieve a package deposited therein.

The window 12 may, in embodiments, be a traditional pre-existing window and the package receiving apparatus 100 may subsequently be configured on the building 10 as a window accessory. Alternately, the window 12, together with the package receiving apparatus 100, may be sold together and installed on the building 10 at the same time. The size of apparatus 100, including the dimensions of the various components thereof, may be selected in line with the requirements of the particular application. In some embodiments, the window 12 is at least ten feet above the ground.

The window 12 may be a double hung window, as shown and known in the art, or another type of window now known or subsequently developed. In the illustrated embodiment, the window 12 includes an upper sash (or panel) 14, a lower sash (or panel) 16, and an outer casing 18. The window sashes 14 and 16 collectively have a height H (see FIG. 2). Specifically, the upper window sash 14 has a height H1 and the lower window sash 16 has a height H2. Height H1 may, but need not, be generally equal to height H2.

Each of the upper sash 14 and the lower sash 16 may be movable relative to the other sash. For example, as is known, the lower sash 16 may be slid upward such that at least a part

thereof is adjacent (e.g., outwardly or inwardly adjacent) the upper sash 14. An intended recipient of a package (or another authorized user) inside the building 10 may access the package receiving apparatus 100 to retrieve a package deposited therein by an unmanned aerial vehicle upon opening the window 12. In embodiments, the window 12 (e.g., one or more sashes thereof) may be opened inwardly (i.e., by moving one or more sashes away from the apparatus 100) to provide access to a package deposited in the apparatus 100.

The apparatus 100, in an example embodiment, may comprise a primary panel 102, a secondary panel 104, end sections 106 and 108, and electronics 110 (discussed below, see FIG. 5) accommodated at least in part in a housing 112.

The primary panel 102 may include a perimeter portion 102P. The perimeter portion 102P may, in embodiments, be generally rectangular. For example, the perimeter portion 102P may include first and second horizontal members 114A and 114B that oppose and are parallel to each other, and first and second side members 114C and 114D that oppose and are parallel to each other. The first and second horizontal members 114A and 114B may extend generally horizontally, and the first and second side members 114C and 114D may extend generally vertically when the apparatus 100 is in a closed position as discussed herein.

The perimeter portion 102P may enclose a screen or mesh 102S, such as the biocide coated UV resistant Super Screen®, or another durable screen. The screen 102S, in embodiments, may be configured so as to not obstruct (or at least significantly obstruct) the view of a user looking through the window 12. That is, a user may be able to view the scene outside the window 12 through the sashes 14 and 16 and the screen 102S outwardly adjacent the window 12. In other embodiments, the screen 102S may be replaced with shutters, louvers, etc., that can be opened and closed to selectively obstruct the view through the window 12.

The secondary panel 104 may likewise include a generally rectangular perimeter portion 104P. The perimeter portion 104P may have two opposing horizontal members 116A and 116B that extend generally horizontally, and two opposing side members 116C and 116D that extend generally vertically when the apparatus 100 is in a closed position. Like the primary panel perimeter portion 102P, the secondary panel perimeter portion 104P may enclose a screen or mesh 104S. The screen 104S may but need not be made of the same materials as the screen 102S (e.g., metals, fiberglass, plastic, etc.).

Each end section 112 and 108 may comprise a foldable (e.g., a fan-foldable) curtain or other member, which may be folded and unfolded akin to traditional Japanese style curtains. The fan-foldable curtains 106 and 108 may comprise metals, plastics, or other desirable materials. The end section 106 may be attached to the first side member 114C of the primary panel 102 and to a vertical member of the window outer casing 18. The end section 108 may likewise be attached to the second side member 114D of the primary panel 102 and to the other vertical member of the window outer casing 18.

As discussed in more detail herein, the package receiving apparatus 100 may initially be in a closed position, may be opened to receive and secure a package deposited therein by an unmanned aerial vehicle, and may close again after the package has been retrieved by the intended recipient. More specifically, the apparatus 100 may: (a) initially be in a closed position, (b) be placed in a package receiving (or intermediate) position to receive a package when an unmanned aerial vehicle (e.g., a verified unmanned aerial

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vehicle as discussed herein) is proximate the apparatus **100**, (c) be placed in a package securing position after the package has been deposited in the apparatus **100**, and (d) return to the closed position after the intended recipient (or another authorized user) has retrieved the package from the apparatus **100**. The repositioning of the apparatus **100** (e.g., from the closed position to the package receiving position, from the package receiving position to the package securing position, etc.) may, in embodiments, be automatic, and may be effectuated at least in part by the electronics **110**. FIG. **2** shows the package receiving apparatus **100** in the package receiving position **100R**. FIG. **3** shows the package receiving apparatus **100** in a package securing position **100P**. And, FIG. **4** shows the package receiving apparatus **100** in a closed or initial position **100C**.

As discussed herein, in the closed position **100C**, the end sections **106** and **108** may be in a folded configuration so as to allow the primary panel **102** to be proximate (and in some embodiments, in contact with) the upper window sash **14** and the lower window sash **16**. More specifically, in the closed position **100C**, each of the primary panel **102** and the secondary panel **104** may extend generally vertically, and the secondary panel **104** may be outwardly adjacent the primary panel **102** (i.e., in the closed position **100C**, the primary panel **102** may extend between the window **12** and the secondary panel **104**). In the package securing position **100P**, the end sections **106** and **108** may be in an extended (or unfolded) configuration, the secondary panel **104** may extend generally horizontally, and the primary panel **102** may extend at an angle **302** (see FIG. **3**) with the vertical plane. In the package receiving position **100R**, the end sections **106** and **108** may be in an extended (or unfolded) configuration such that the primary panel **102** extends at the angle **302**, and the secondary panel **104** may extend generally parallel to the primary panel **102** (or may extend at another angle with respect to the vertical plane so as to allow the package(s) to be deposited in the apparatus **100**). In the package receiving position **100R**, thus, the end sections **106** and **108**, together with the window **12** and the primary panel **102**, may form a package receiving area **202** (see FIG. **2**) for receiving a package deposited by an unmanned aerial vehicle. Once a package (or packages) has been deposited in the package receiving area **202**, the secondary panel **104** may rotate and extend generally horizontally to abut the casing **18** as shown in FIG. **3**; this may close the package receiving area **202** and secure the package in the package securing position **100P**. When the intended recipient wishes to retrieve the package deposited in the package receiving area **202**, he or she may open the window **12** to access the area **202** and pull the package inside the building **10** through the window **12**. The apparatus **100** may then, upon user command or automatically, return to the closed position **100C** (FIG. **4**).

In more detail, the primary panel **102** may be rotatably coupled to the outer casing **18** via primary actuating members **118**. For example, as shown in FIG. **1**, a first primary actuating member **118A** may extend between the first side member **114C** of the perimeter portion **102P** and the corresponding vertical member of the outer casing **18**, and a second generally identical primary actuating member (not clearly visible in FIG. **1**) may likewise extend between the second side member **114D** of the perimeter portion **102P** and the corresponding vertical member of the outer casing **18**. The primary actuating members **118** may, in embodiments, be hinges for example, the operation of which may be controlled by the electronics (comprising a motor, for example). Alternately, telescoping members, gears, etc.,

may serve as the primary actuating members **118** to allow the primary panel **102** to selectively move with respect to the outer casing **18**.

Each primary actuating member **118** may be adjacent one of the end sections **106** and **108**. For example, as shown in FIG. **1**, the first hinge **118A** may be outwardly (or inwardly) adjacent the end section **106**, and the second hinge (not clearly visible in FIG. **1**) may be outwardly (or inwardly) adjacent the end section **108**. The first hinge **118A** and the second hinge may collectively allow the primary panel **102** to: (a) rotate in a direction A (FIG. **2**) away from the casing **18** and extend at the angle **302** when the apparatus **100** moves from the closed position **100C** to the package receiving position **100R**; and (b) rotate in a direction B towards the casing **18** and extend generally vertically when the apparatus **100** moves from the package securing position **100P** to the closed position **100C**. In some embodiments, the hinges (e.g., each of the first hinge **118A** and the second hinge) may be omitted, and the end sections **106** and **108** themselves may allow the primary panel **102** to be selectively moved relative to the window **12**.

The secondary panel **104** may be rotatably coupled to the primary panel **102** via secondary actuating members **120**. For example, the first horizontal member **114A** of the primary panel **102** and the second horizontal member **116B** of the secondary panel **104** may be coupled via gears **120A** and **120B** (or hinges or other means) to allow the secondary panel **104** to move relative to the primary panel **102**. More specifically, the gears **120** may allow the secondary panel **104** to move relative to the primary panel **102** such that the secondary panel **104**: (a) extends generally horizontally in the package securing position **100P** (see FIG. **3**); (b) extends generally vertically in the closed position **100C** (see FIG. **4**) such that the horizontal member **116A** is below the horizontal member **116B**; and (c) extends at the angle **302** (or another angle) in the package receiving position **100R** (see FIG. **2**).

In an embodiment, the height of the primary panel **102** may be generally equal to the height H (i.e., the height of the primary panel **102** may be generally equal to the collective height of the upper sash **14** and the lower sash **16**). The height of the secondary panel **104** may be generally equal to the height H1 (i.e., the height of the secondary panel **104** may be generally equal to the height of the upper sash **14**). Thus, in the closed position **100C**: (a) the primary panel **102** may act as a traditional window screen and overlay each of the first sash **14** and the second sash **16**; and (b) the secondary panel **104** may overlay the primary panel **102** (i.e., the secondary panel **104** may be outwardly adjacent the primary panel **102** which is outwardly adjacent the window **12**) and may generally correspond to the upper sash **14**. In embodiments, when in the closed position **100C**, a user may be able to view the scene outside the window (i.e., the user may be able to see the scene outside the window **12** through each of the upper sash **14**, the screen **102S**, and the screen **104S**; and, the user may be able to see the scene outside the window **12** through the lower sash **16** and the screen **102S**).

FIG. **5B** shows the electronics **110** which may at least in part be housed in the housing **112**. In embodiments, the housing **112** may be affixed to the secondary panel **104** as shown in FIG. **1**. In other embodiments, the housing **112** may be affixed to the primary panel **102** or to the building **10** proximate the window **12**. In other embodiments still, the housing **112** may include two or more housings each of which accommodate electronics to facilitate the workings of the apparatus **100** (e.g., the housing **112** may comprise a

primary housing located in a central area and a secondary housing located proximate the apparatus **100**).

The electronics **110** may, in embodiments, include an apparatus computer **502**. The apparatus computer **502**, or at least portions thereof, may be housed in the housing **112**.

The example apparatus computer **502** includes a processor **504** communicatively coupled to a memory **506**, an energy harvester **507**, a sensor (or sensors) **508**, a temperature control element **509**, a camera **510**, and a networking interface **512**. Processor **504** represents one or more digital processors. In some example embodiments, the processor **504** may be configured through particularly configured hardware, such as an application specific integrated circuit (ASIC), field-programmable gate array (FPGA), etc., and/or through execution of software to perform functions in accordance with the disclosure herein. Network interface **512** may be implemented as one or both of a wired network interface and a wireless network (e.g., Wi-Fi, Internet, Bluetooth, etc.) interface, as is known in the art. Memory **506** represents one or more of volatile memory (e.g., RAM) and non-volatile memory (e.g., ROM, FLASH, magnetic media, optical media, etc.). Although shown within the apparatus computer **502**, memory **506** may be, at least in part, implemented as network storage that is external to the apparatus **100** and accessed via network interface **512**. The camera **510** may be a video camera or a still camera, and may comprise CMOS, CCD, and/or other imaging devices now known or subsequently developed.

Apparatus software **514** may be stored in a transitory or non-transitory portion of the memory **506**. Apparatus software **514** includes machine readable instructions that are executed by processor **504** to perform the functionality of the apparatus **100** as described herein. In the illustrated example, the apparatus software **514** comprises an actuating module **516**, a UAV verification (or authenticating) module **518**, a notification module **520**, an energy harvesting module **507A**, a thermal manager **509A**, and a UAV guiding module **511**. In some embodiments, in addition to or in lieu of the UAV certification module **518**, the apparatus software **514** may include a gesture recognizer **522**. The apparatus software **514** is discussed in more detail below. In embodiments, only a part of the apparatus software **514** may be housed in the memory **506**, whereas the remainder thereof may be housed elsewhere (e.g., on the cloud) or on another distributed network.

The apparatus computer **502** may be configured to communicate with an unmanned aerial vehicle **530** when the unmanned aerial vehicle **530** is proximate (e.g., within twenty or so feet of) the apparatus **100**. The communication between the apparatus computer **502** and the unmanned aerial vehicle **530** may preferably be wireless communication. The unmanned aerial vehicle **530** is shown in FIG. **5A**.

In more detail, the unmanned aerial vehicle (UAV) **530** may have a UAV computer **532**. The UAV computer **532** may have a digital processor **534** in data communication with a communication device **536**, a package analyzer **537**, a memory **538**, and optionally, a verification (or authentication) device **540**. The communication device **536** may be any communication device that allows the UAV computer **532** to wirelessly communicate with other electronic devices over a network (such as a Bluetooth, Wi-Fi, or other network). As discussed herein, the verification device **540**, where employed, may allow the UAV **530** to verify that the apparatus **100** in which the UAV **530** is depositing a package is associated with the intended recipient of the package. In embodiments, the verification device **540** may include a transmission device and a receiving device; for instance, the

verification device **540** may include a laser (or other light, such as a visible) light emitter and receiver configured to receive energy reflected off the apparatus **100**. Alternately or in addition, the verification device **540** may include a receiver configured to detect a unique visible or invisible signal (i.e., a signature) emitted by the apparatus **100** and verify the apparatus **100** using same.

In an embodiment, the UAV memory **538** may include UAV software **542** that enables the UAV **530** to travel to the apparatus **100**, confirm that the apparatus **100** is associated with the intended recipient, and deposit a package therein. Specifically, the UAV software **542** may, in embodiments, include a flight path module **544**, an apparatus verification module **546**, a route optimizer **547**, a package drop off module **548**, and a drop off confirmation module **550**, the functionality of each of which is described in more detail below.

The apparatus **100**, and specifically the computer **502** thereof, may also selectively communicate with a user **560** via a personal computer **562** of the user **560**, shown in FIG. **5C**. The user **560** may be the intended recipient of the package or another individual or group of individuals authorized by the intended recipient to collect the package from the apparatus **100** on the recipient's behalf. The personal computer **562** may be one or more of a laptop, desktop, mobile phone, tablet, or other computing device. As is known, the personal computer **562** may have a processor **564** in data communication with a networking device **566**, an input/output device (such as a touchscreen display, keyboard, etc.) **568**, and a memory **570**. The user **560** may, in embodiments, download and install a package receiving application **572** into the memory **570** to interact with the apparatus **100**. During the installation process, the user **560** may enter into the application **572** information about (e.g., identifying) the user **560**, such as his or her name, address, preferred package receiving times, etc. In embodiments, each apparatus **100** may have a unique serial number (e.g., a unique alpha-numeric string) associated therewith that, for example, includes the size, model number, geographical coordinates, etc., of the apparatus **100**; in these embodiments, the user **560** may, during the installation process, enter the unique serial number associated with the apparatus **100** into the package receiving application **572** to allow for the user **560** to be associated with the particular apparatus **100**.

Example operation of the apparatus **100** will now be described with reference to FIGS. **1-5C**. The apparatus **100** may initially be in the closed position **100C**. Assume, for example, that an unmanned aerial vehicle (such as an autonomous, semi-autonomous, or other unmanned aerial vehicle) is to deliver a package to the recipient **560**. The sender (or another, e.g., the owner or operator of the UAV **530**) may enter into the UAV software **542** the geographical location of the apparatus **100** associated with the recipient **560**. In some embodiments, the unique serial number associated with the particular apparatus **100** may be entered into the UAV software **542** and the software **542** may glean the geographical location of the apparatus **100** therefrom. The sender may also couple the package to the UAV **530** (e.g., the UAV **530** may have a package holding apparatus and the package may be secured therein or otherwise secured thereto). Package holding apparatuses for unmanned aerial vehicles, such as the UAV **530**, are known in the art. Of course, the UAV **530** may also include a package holding apparatus that is subsequently developed.

The flight path module **544** may be configured to determine a flight path for the UAV **530** so that the UAV **530** can

safely and efficiently travel to the apparatus **100**. The flight path module **544** may, for example, employ publicly available geospatial data to determine a preferred flight path to the apparatus **100**. Alternately, in embodiments, the sender (or drone operator) may manually enter a flight path in the flight path module **544**. In other embodiments still, the sender may remotely and manually operate the UAV **530** to cause it to travel to the apparatus **100**.

In embodiments, the UAV **530** may carry a package for the user **560** together with another package for another user (or additional packages for multiple different users). In these embodiments, the route optimizer **547** may compute the route that allows the UAV **530** to deliver the packages to the various apparatuses (e.g., apparatus **100** and other such apparatuses) efficiently based on governing criteria. In embodiments, the route optimizer **547** may use time as the governing criteria—that is, in embodiments, the route optimizer **547** may select for the UAV **530** the route which allows the UAV **530** to deliver all the packages in the shortest amount of time. In other embodiments, the route optimizer **547** may use fuel consumption as the governing criteria. In other embodiments, the route optimizer **547** may select its route based on the preferences indicated by the user **560** (and other users); e.g., if the user **560** prefers to receive packages before 5 pm and another user prefers to receive packages after 5 pm, the UAV **530** may deliver the package to the user **560** and then deliver the package to other user.

The package (e.g., package **814**, see FIG. **8D**) may, in embodiments, have identifying indicia placed thereon. The package identifying indicia may be, for example, an alphanumeric string, a conventional barcode, a QR code, etc., and the UAV **530** may include appropriate hardware and/or software to capture the package identifying indicia and evaluate the package and/or package contents based thereon. For example, in embodiments, the package identifying indicia may indicate that the package delivery is time-sensitive (e.g., the package contains an organ, a medication, a food that is best consumed hot, etc.). In these embodiments, the route optimizer **547** may take such into account and select a route that allows the UAV **530** to make the time-sensitive deliveries on time.

The package **814**, and/or the UAV **530** itself, may contain identifying indicia that can be encoded to be readable by both humans and machines. The identifying content (e.g., the font(s), shape(s), etc. thereof) may utilize strategically positioned and shaped geometric figure patterns. The figure patterns and 'angles of perspective' may be used to derive position and vector angles between an observer and the UAV or package. Viewing techniques may be automated and utilize position and navigation algorithms to mathematically decoded package location, position, leveling, contents and vectored angle predictive trending. These techniques may be used to minimize undesirable shock and vibration during navigational approach and deployment of a package. The viewed pattern perspectives of known geometric patterns may be acquired and processed in real-time from a two-dimensional or a three-dimensional (i.e. stereoscopic) view-point perspective. These methods may utilize 3-D spatial mapping and marking techniques to maximize safe and balanced delivery of the package by the UAV **530**.

To illustrate the workings of the apparatus **100**, assume that the UAV **530** is to deliver a package to the apparatus **100**. When the UAV **530** comes proximate (e.g., within twenty or so feet of) the apparatus **100**, the apparatus verification module **546** of the UAV software **542** may ensure that the package being delivered is to be delivered to the particular apparatus **100**. As noted, the building **10** may

have more than one package receiving apparatus **100**, and as such, there may be a plurality of apparatuses **100** in the vicinity. The apparatus verification module **546** may ensure that the package is delivered to the apparatus **100** associated with the intended recipient **560**.

In some embodiments, the apparatus verification (or authentication) module **546** may employ the verification device **540** to verify that the package is being delivered to the intended apparatus **100**. For example, in an embodiment, each apparatus **100** may have a unique visible (or other) marker(s), such as the marker **130** (FIG. **4**), and the verification device **540** may read same to confirm that the package is delivered to the intended apparatus **100**. The marker **130** may be passive or active. For instance, the marker **130** may be a two or three dimensional bar code and the verification device **540** may comprise a barcode scanner. Or, for example, the marker **130** may be an LED or other light source that blinks at a particular frequency and the verification device **540** may comprise a light sensor configured to read the light pattern to verify the particular apparatus **100** (the frequency of the blinking light may be such that the blinking may or may not be perceptible to the human eye). In some embodiments, when the UAV **530** is proximate the apparatus **100**, the apparatus software **514**, via the network interface **512**, may transmit (e.g., over Bluetooth or another near-field network) to the communication device **536** of the UAV **530** a uniquely encoded signal which allows the apparatus verification module **546** to verify that the UAV **530** is interacting with the appropriate apparatus **100**. Other verifications means (such as RFID, ultrasonic communications, etc.) may alternately or additionally be utilized. Thus, the artisan will understand from the disclosure herein that the UAV **530** may, in embodiments, ascertain information about each of the package and the apparatus **100** by reading and evaluating the respective indicators (e.g., barcodes, markers, alpha-numeric strings, etc.) placed thereon. In embodiments, where the authentication device **540** is unable to authenticate the UAV as a UAV authorized to deliver a package thereto, the apparatus **100** may remain in the closed position **100C** to preclude the unauthorized package from being delivered to the apparatus **100**.

In embodiments, the apparatus **100**, and specifically the UAV identification module **518** thereof, may likewise verify that the UAV **530** is an unmanned vehicle authorized to deliver packages to the apparatus **100**. Such may ensure that an unmanned aerial vehicle owned or operated by an unscrupulous person or group of people is unable to deliver a package (containing a bomb or Anthrax, for example) to the apparatus **100**. Further, in embodiments, once the apparatus **100** has verified the UAV **530**, a record of same may be stored at a remote location and/or in the memory **506**; such may curtail the use of unmanned aerial vehicles to deliver firearms, drugs, etc., to the apparatus **100**.

The UAV identification module **518** may identify the UAV **530** to ensure that the unmanned aerial vehicle is authorized to deliver a package to the apparatus **100** in one of any number of ways. In embodiments, the communication device **536** of the UAV **530** may communicate a uniquely encoded signal to the apparatus **502**, and the signal, once received by the network interface **512**, may be decoded by the UAV identification module **518** to approve the delivery of the package by the unmanned aerial vehicle **530**.

In some embodiments, the apparatus software **514** may include a gesture recognizer **522**, and the apparatus **100** may employ same to ensure that the unmanned aerial vehicle **530** is authorized to deliver a package to the apparatus **100**. More specifically, the electronics **110** may include the camera **510**

and the gesture recognizer 522 may include image processing capabilities; the UAV 530 may make a gesture (e.g., fly up three feet and down three feet three times, fly in a circle twice, etc.) and the gesture recognizer 522 may process and compare same to authorized UAV gestures to determine that the UAV 530 is authorized to deliver a package to the apparatus 100.

The camera(s) 510 may, in embodiments, be used to serve additional purposes. For example, in embodiments, the apparatus 100 may include more than one camera 510, at least one of which is configured to view the scene inside the package receiving area 202. The camera 510, together with image processing apparatus associated with the apparatus computer 502, may determine if the package is damaged, for instance; and, if so, the notification module 520 may notify the user 560 and/or the UAV computer 532 so that a record of the event could be created.

In embodiments, the UAV verification (or authentication) device 518 may utilize affirmative positive acknowledgement to the verification and authentication protocol methods and/or utilize intentionally misleading cues and triggers throughout the authentication process. For example, a visual lighted indication to move right could be an arrow shape pointing right. This right indicator may actually be intentionally counter-intuitive by protocol design to indicate that the UAV 530 should move left. Therefore, if the UAV 530 moves to the right as a result of this indicator cue, the authenticator 518 may ascertain that the UAV 530 is not authorized to deliver a package to the apparatus 100, and may therefore remain in the closed position 100C to preclude the unauthorized UAV from delivering a package to the apparatus 100. In these embodiments, authorized UAVs (e.g., UAV 530) may include logic to allow the UAV to respond appropriately to the acknowledgement requests transmitted by the apparatus 100 (e.g., in this example, the authorized UAV 530 may move left in response to the lighting of an arrow that appears to instruct the UAV 530 to move right). Verification and security systems and methods are further described in U.S. patent application Ser. No. 15/595,913, the entirety of which is incorporated herein by reference.

Once the apparatus verification module 546 of the UAV software 542 has verified the apparatus 100 and/or the UAV identification module 518 of the apparatus software 514 has verified the UAV 530, the actuating module 516 of the apparatus software 514 may cause the apparatus 100 to move from the closed position 100C (FIG. 4) to the package receiving position 100R (FIG. 2). Specifically, the actuating module 516 may be in data communication with the primary actuating members 118 and the secondary actuating members 120, and may cause same to selectively actuate to cause the apparatus 100 to move from the closed position 100C to the package receiving position 100R. For example, the actuating module 516 may cause the primary actuating members 118 (e.g., the hinges) to extend such that the primary panel 102, which in the closed position 100C extended generally vertically, now extends at the angle 302. The actuating module 516 may likewise cause the secondary actuating members 120 (e.g., the gears) to actuate such that the secondary panel 104, which in the closed position extended generally vertically, now extends at the angle 302 (or another angle) to create the package receiving area 202.

When the apparatus 100 is in the package receiving position 100R, the UAV guiding module 511 may guide the UAV 530 to the apparatus 100 so that the UAV 530 may deliver a package to the apparatus 100. For example, if there is a tree or other object (e.g., construction equipment that is

temporarily placed in the path of the UAV 530 to the apparatus 100), the sensor 508 (e.g., a proximity sensor, a sonar device, a camera with image processing capabilities, etc.) may determine the presence of the obstacle and the UAV guiding module 511 may communicate same to the route optimizer 547 to enable the UAV 530 to safely deliver the package to the apparatus 100 around the obstacle. In some embodiments, e.g., if the apparatus 100 is full and/or is otherwise unable to receive a package (e.g., where the user 560 is not available to retrieve the package), the UAV guiding module 511 may communicate with the route optimizer 547 and direct the UAV 530 to redeliver the package at a more suitable time.

After the actuating module 516 has caused the apparatus 100 to move from the closed position 100C to the package receiving position 100R, the package drop off module 548 may cause the UAV to drop off the package(s) into the package receiving area 202 of the apparatus 100. For example, the package holding apparatus of the UAV 530 may, in response to a communication by the package drop off module 548, cause the package to be lowered (or otherwise dropped) into the package receiving area 202. In embodiments, the actuating module 516 of the apparatus 100 may communicate with the package drop off module 548 of the UAV 530 to apprise the UAV 530 that the apparatus 100 is ready to accept the package (e.g., once the apparatus 100 has moved from the closed position 100C to the package receiving position 100R, the actuating module 516 may communicate a drop off signal to the package drop off module 548 to apprise the UAV 530 that the apparatus 100 is ready to accept the package).

The sensor 508 may be a machine code reader (e.g., a barcode scanner), a weight scale, or other sensor that allows the apparatus computer 502 to determine at least one characteristic of the package dropped off (or being dropped off) into the package receiving area 202. For example, in some embodiments, the package being dropped off the by UAV 530 may have a barcode or other machine readable indicia and the sensor 508 may read same so as to allow the software 514 (e.g., the notification module 520) to determine the contents of (or other information about) the package. Alternately or additionally, the sensor 508 may determine the weight of the package and the notification module 520 may compare same to the expected weight of the package that is to be delivered to the apparatus 100. Such may provide further confidence that the appropriate package has been delivered to the apparatus 100. Alternately or additionally, in some embodiments, the package analyzer 537 of the UAV 530 may determine at least one characteristic of the package being delivered (e.g., upon reading a barcode or other indicia associated with the package) and communicate said at least one characteristic to the apparatus computer 502 so that the apparatus 100 may take appropriate action. Thus, the apparatus 100 may determine a characteristic of the package using the software 514 and the sensor 508 and/or a characteristic of the package may be gleaned by the UAV 530 and communicated to the apparatus computer 502. The apparatus 100 may employ this information as desirable.

For instance, in an embodiment, the apparatus 100 may include the temperature control element 509 (e.g., a heating element, a cooling element, a humidifier, etc.), and the thermal manager 509A of the apparatus software 514 may control the operation of same in line with the requirements of the particular application. For example, if the package analyzer 537 of the UAV 530 and/or the sensor 508 of the apparatus 100 determines that the package contains a hot food item (e.g., a pizza, a sandwich, etc.), a cold food item

(e.g., ice cream, soda, etc.), or another item whose temperature must or should be controlled (e.g., an organ from an organ donor, medication, etc.), the thermal manager module 509A may automatically operate the temperature control element 509 to ensure that the apparatus 100 maintains the package at the desired temperature within the package receiving area 202. The artisan will appreciate that the temperature control element 509 may be disposed outside the electronics housing 112. In some embodiments, the screens (e.g., the screen 102S, the screen 104S, etc.) may be replaced with fabric or other material to allow for the temperature of the package receiving area to be better maintained.

After the package has been received in the package receiving area 202 of the apparatus 100, the actuating module 516 may actuate the secondary actuating members 120 to cause the secondary panel 104 to move relative to the primary panel 102 and extend generally horizontally to close off the package receiving area 202 in the package securing position 100P (FIG. 3). The package may thereby be secured within the apparatus 100, and specifically, the package receiving area 202 thereof. In some embodiments, a lock openable by the user 560 may be provided so that the package is locked within the area 202 and is generally inaccessible from outside the window 12.

The notification module 520 may notify the user 560 that a package has been received in the apparatus 100. For example, the notification module 520 may employ the network interface 512 to send the alert module 576 of the personal computer 562 a message outlining that the package has been received. The alert module 576 may, for example, ring, beep, vibrate, etc., to convey to the user 560 that a package has been delivered to the apparatus 100. Alternately, the notification module 520 may send a text message, e-mail, voicemail, etc., to the user 560 to apprise the user of the delivery of the package. In some embodiments, the alert module 576 may be configured to apprise multiple parties that a package has been delivered to the apparatus 100.

The user 560 may, in response to a notification by the notification module 520 (or otherwise), open the window 12 from inside the building 10 and retrieve the package through the window. The sensor 508 may indicate that the package has been removed from the package receiving area 202, which may in-turn cause the actuating module 516 to move the apparatus 100 from the package securing position 100P to the closed position 100C. That is, the actuating module 516 may cause the secondary actuating members 120 to cause the secondary panel 104 to rotate and extend generally vertically, and may cause the primary actuating members 118 to retract to cause the primary panel 102 to extend generally vertically and correspond to the window panels 14 and 16 as discussed above. Alternately, in embodiments, the package receiving application 572 of the personal computer 562 may have a manual operating module 574 and the user 560 may employ same to transmit a wireless signal to the apparatus 100; the actuating module 516, in response to this user command, may move the apparatus 100 from the package securing position 100P to the closed position 100C. The user 560, in embodiments, may likewise use the manual operating module 574 to place the apparatus 100 in the open position 110C and/or the package receiving position 100R.

While not required, in embodiments, the user may use the rating module 577 to rate the delivery by the UAV 530. The rating module 577 may further allow the user 560 to provide comments to the UAV operator. For example, the user 560 may use the personal computer 562 and the ratings module

577 to apprise the sender that the package delivery was as expected, is in need of improvement, etc.

Power to the apparatus 100, e.g., to the apparatus computer 502 and its associated components (such as the actuators, thermal control elements 509, sensors 508, camera(s) 510, etc.) may be provided in one or more of any number of ways. In an embodiment, standard AC power from the building 10 may be used to the power the apparatus 100. In some embodiments, a rechargeable or other battery may be used to power the apparatus 100. Alternately or in addition, the energy harvester 507 (e.g., solar cells, wind energy devices, etc.) may be controlled by the energy harvesting module 507A and harvest energy to provide power to the apparatus 100. It is envisioned that the energy harvester 507, together with the energy harvesting module 507A, may in embodiments also provide power to the building 10.

Thus, as has been described, the apparatus 100 may, among other things: (a) act as a window screen in the closed position 100C; (b) receive a package from an unmanned aerial vehicle (e.g., the UAV 530) in the package receiving position 100R after verifying that the unmanned aerial vehicle is authorized to deliver a package thereto; (c) secure the package in the package securing position 100P after the package has been deposited by the UAV 530 in the package receiving area 202; (d) determine at least one characteristic of the package; (e) notify the user that a package is ready to be picked up by the user; and/or (f) return to the closed position 100C after the package has been retrieved by the user.

While the structure for the package receiving apparatus 100 is disclosed in detail above, the artisan will appreciate that this structure is not intended to be independently limiting and that the package receiving apparatus 100 may take on other shapes and/or different forms. For example, in an embodiment, a window awning may serve as the package receiving apparatus and may automatically be lowered (e.g., by the electronics 110) at the window connection point to receive a package delivered by an unmanned aerial vehicle.

In embodiments, the window 12 may be, for example, a storm window. Of course, the apparatus 100 (and the other package receiving apparatuses discussed herein) may be used in conjunction with storm doors, garage doors, window awnings, etc.

Focus is directed now to FIGS. 6A-6C, which show an alternate embodiment 600 of the package receiving apparatus 100. The package receiving apparatus 600 may be similar to the package receiving apparatus 100, except as specifically noted and/or shown, or as would be inherent. Further, those skilled in the art will appreciate that the apparatus 100 (and thus the apparatus 600) may be modified in various ways, such as through incorporating all or part of any of the various described embodiments, for example. For uniformity and brevity, corresponding reference numbers may be used to indicate corresponding parts, though with any noted deviations.

The package receiving apparatus 600 may, akin to the apparatus 100, be configured outside the window 12. The example apparatus 600 has a primary panel 602, an intermediate portion 604, and two opposing slidable members 606 (e.g., slidable member 606A and an opposing slidable member). Each slidable member 606 may be configured to slide within a channel or groove 608 (e.g., the slidable member 606A may be configured to slide within the channel 608A and the other slidable member may be configured to slide within the channel 608B).

The primary panel 602, in an embodiment, may comprise two or more sections (e.g., sections 602A and 602B). The

sections **602A** and **602B** may be selectively opened and closed to allow a user to view the scene outside the window **12**.

The primary panel **602** may be rotatably coupled to the intermediate portion **604** via rotatable members **612**. The rotatable members **612** may, for example, rotate in a counterclockwise to cause the primary panel **602** to move towards the intermediate portion **604**, and rotate in a clockwise direction to cause the primary panel **602** to move away from the intermediate portion **604**. The apparatus **600** may comprise electronics, such as the electronics **110** discussed above for apparatus **100**, to allow the apparatus **600** to receive a package and notify the user of same.

FIG. 6C shows the apparatus **600** in a closed position **600C**. As can be appreciated, to place the apparatus **600** in the closed position **600C**, the: (a) slidable members **606** may slide in the direction B6 to cause the intermediate portion **604** to extend generally vertically proximate and adjacent the window **12**; and (b) the rotatable members **612** may rotate in the counter clockwise direction to cause the primary panel **602** to also extend generally vertically and essentially act as a shade for the window **12**. When an unmanned aerial vehicle, such as the unmanned aerial vehicle **530** comes proximate the apparatus **600**, the electronics thereof may communicate with the UAV **530** as discussed above for the apparatus **100** and cause the apparatus **600** to move from the closed position **600C** (FIG. 6C) to the package receiving position **600R** (FIGS. 6A and 6B). Specifically, once the apparatus **600** confirms that the UAV **530** is authorized to deposit a package in a package receiving area **614** thereof, the: (a) slidable members **606** may slide in the direction B6 to cause the intermediate portion to extend at an angle C6 with the vertical; and (b) rotatable members **612** may rotate in the clockwise direction to cause the primary panel **602** to extend at an angle D6 with the vertical. Such may provide the UAV **530** access to the package receiving area **614**, and the UAV **530** may deposit a package therein. The notification module of the apparatus **600**, as discussed above for the apparatus **100**, may notify the user that a package has been deposited in the apparatus **600** and may be retrieved therefrom. The user, upon receiving the notification, may open the window **12** from inside the building **10** and retrieve the package. Once the package has been removed, the apparatus **600** may automatically (or in some embodiments, based on user command) shift from the package receiving position **600R** to the closed position **600C**. As discussed above for the apparatus **100**, the apparatus **600** may include one or more sensors that determine at least one characteristic of the package deposited in the apparatus **600**.

FIGS. 7A-7B show another alternate embodiment **700** of the package receiving apparatus **100**. The package receiving apparatus **700** may be similar to the package receiving apparatus **100**, except as specifically noted and/or shown, or as would be inherent. Further, those skilled in the art will appreciate that the apparatus **100** (and thus the apparatus **700**) may be modified in various ways, such as through incorporating all or part of any of the various described embodiments, for example. For uniformity and brevity, corresponding reference numbers may be used to indicate corresponding parts, though with any noted deviations.

The apparatus **700**, akin to the apparatuses **100** and **600** discussed above, may be configured outside a window (e.g., window **12**). Further, like the apparatus **100** (and apparatus **600**) discussed above, the apparatus **700** may include electronics (e.g., electronics **110**, housed in a housing, for example) that: (a) cause the apparatus **700** to move from a

closed position **700C** (FIG. 7B) to a package receiving position **700R** (FIG. 7A) to receive a package when an unmanned aerial vehicle (e.g., UAV **530**) is proximate the apparatus **700**; (b) cause the apparatus **700** to move from the package receiving position **700R** back to the closed position **700C** when the package has been retrieved from the apparatus **700** by the user. As discussed above for other embodiments, the user **560** may retrieve the package from inside the building upon opening the window **12**.

In more detail, the apparatus **700** may comprise a first linkage **704** having a first bar **704A** and a second bar **704B** that is rotatably coupled to the first bar **704A** at a joint **703**. The apparatus **700** may further include a second linkage **706** having a first bar **706A** and a second bar **706B** that is rotatably coupled to the first bar **706A** at a joint **705**. The joints **703**, **705** may be hinges or other rotatable members whose movement may be controlled by the electronics (e.g., electronics **110**) associated with the apparatus **700**.

The first bar **706A** of the second linkage **706** may be slidably coupled to a limiter **710** having stops at either side. The limiter **710** may in-turn be coupled to the window **12**. The first bar **706A** of the second linkage **706** may be configured to slide within the limiter until it abuts one of the ends thereof. The apparatus **700** may include shutters, louvers, etc. (e.g., shutters **750**, see FIG. 7B) that may be selectively opened and closed as desired to view or obstruct the scene outside the window **12**.

The apparatus **700** may traditionally be in the closed position **700C**. When the UAV **530** comes proximate the apparatus **700**, the electronics thereof may confirm that the UAV **530** is authorized to deliver a package to the apparatus **700** (as discussed above for other embodiments). Once the authorization is complete, the apparatus **700** may automatically move from the closed position **700C** (FIG. 7B) to the package receiving position **700R** (FIG. 7A). Specifically, the second linkage first bar **706A** may slide in the direction **740** within the limiter **710** and the second bar **706B** of the second linkage **706** may rotate in a counter clockwise direction to create a package receiving area **760** to receive the package. Once the package is deposited in the apparatus **700**, the electronics associated with the apparatus **700** may notify the user **560** of same. The user **560** may retrieve the package upon opening the window, and thereafter, the apparatus **700** may automatically move from the package receiving position **100R** to the closed position **100C**. As can be appreciated, in this configuration, the apparatus **700** may serve as traditional shutters on the window **12**.

Focus is directed now to FIGS. **8A-8E** to illustrate yet another embodiment of the package receiving apparatus, referred to herein as a pop-up (or collapsible) package receiving apparatus **800**. The package receiving apparatus **800** may be similar to the package receiving apparatus **100**, except as specifically noted and/or shown, or as would be inherent. Further, those skilled in the art will appreciate that the apparatus **100** (and thus the apparatus **800**) may be modified in various ways, such as through incorporating all or part of any of the various described embodiments, for example. For uniformity and brevity, corresponding reference numbers may be used to indicate corresponding parts, though with any noted deviations.

The collapsible package receiving apparatus **800** may include a pop-up package receiver **802**, which is shown in a collapsed position **802C** in FIG. **8A** and in an open or pop-out position **8020** in FIG. **8B**. The pop-up package receiver **802** may comprise polyester, other fabrics, or other desirable materials that allow the package receiver **802** to be collapsed during periods of non-use.

Unlike the other embodiments discussed above, the package receiving apparatus **800** need not necessarily be configured outside a window; rather, the package receiving apparatus **800** may be movably coupled to the building **10**, e.g., to a gutter **806A** or other such structure present on the roof of (or elsewhere on) a residential or other building **12**. More specifically, in an embodiment, the package receiver **802** may include one or more supporting (or suspending) members, such as hooks **804A** and **804B** for example, to allow the receiver **802** to be movably coupled to the gutter **806A** via a rope or string **808** (akin to a flag, for instance). In some embodiments, a pulley **806** or other means may be provided to allow a user to conveniently raise the package receiver **802** when the delivery of a package thereto is expected. The hooks **804A**, **804B**, together with the rope **808** and the pulley **806** may collectively be referred to herein as the elevating means **807**. Of course, other means may alternately or additionally be provided to allow a user to elevate the package receiver **802** when desired so that the UAV **530** can feasibly deliver a package thereto.

It is envisioned that the package receiving apparatus **800**, and specifically, the package receiver **802** thereof, will generally remain in its collapsed position **802C** for storage, and will be opened and raised to retrieve a package only on days (or times) on which the delivery of a package or packages is expected. Such functionality may allow the package receiving apparatus **800** to have a reduced form factor when not in use, which may be preferable as the collapsed package receiver **802** may not substantially detract from the appearance of the building **10**. In embodiments, when not in use, the package receiver **802** may, in its collapsed position **802C**, be removably coupled to the ground, such as via stake **809**, a weight, a hook, et cetera. Such may ensure that the package receiver **802** remains in place despite strong winds and other such elements encountered thereby.

As shown in FIG. **8B**, the user (e.g., the user **560**, see FIG. **5**) may place the pop-up package receiver **802** in its open position **8020** when the delivery of a package to the receiver **802** is expected. The user may then raise the package receiver **802** via the elevating means **807** and place it in a package receiving position **802R** adjacent or otherwise proximate the gutter **806A** (see FIG. **8C**) so that a UAV (e.g., UAV **530**, see FIGS. **5**, **8D**) may deliver a package to the receiver **802**.

In embodiments, the receiver **802** may include a package receiving area **810**, e.g., a cavity **812** defined by the receiver walls that can be accessed from a top side of the receiver **802** to allow the UAV **530** to deposit a package **814** therein (FIG. **8D**). Once the package has been delivered, the user **560** may be notified of same as discussed above for the other embodiments; for example, the user **560** may be notified of the delivery of the package **814** via electronics (e.g., electronics **110**) that communicate with the mobile device (e.g., with the mobile application **572**, see FIG. **5**) of the user **560**. When the user **560** wishes to retrieve the package **814**, he may use the elevating means **807** to lower the package receiver **802** such that it is proximate (e.g., in contact with) the ground surface. The user **560** may then extract the package **814** from the collapsible receiver **802**. For instance, the receiver **802** may include a zipper Z (FIG. **8D**) or other means (e.g., buttons, latches, etc.) to allow the user **560** to open a section **815** of the receiver **802** to access the cavity **812** from a side of the package receiver **802** to retrieve the package **814** in the cavity **812**. The user **560** may then conveniently fold the receiver **802** (i.e., place it in the closed or collapsed position **802C**, FIG. **8A**) for storage.

In an embodiment, the pop-up package receiver **802** comprise, for example, an off the shelf pop-up pod changing room, such as a GigaTent or other pod changing room, with minor modifications. For example, in embodiments, one or more holes **817** (see FIG. **8B**) may be formed at the bottom of (or elsewhere on) the package receiver **802** to preclude rain water and other such elements from undesirably collecting in the package receiving area **810**.

The package receiver **802** may include many or all of the electronics **110** discussed above for apparatus **100**. For example, the package receiver **802** may have a housing (e.g., a complete or partial enclosure) **822** retaining electronics **824** shown in more detail in FIG. **9**. The electronics **824** may include an apparatus computer **903**, which may allow the package receiving apparatus **800** to selectively communicate with the UAV **530** and the personal computer **562** discussed above in more detail with respect to FIG. **5**.

The package receiver computer **903**, or at least portions thereof, may be housed in the housing **822**. The example package receiver **903** includes a processor **901** communicatively coupled to a memory **902**, a sensor or sensors **916**, an energy harvester **917**, a camera **914**, a networking interface **918**, and a temperature control element **919**. Processor **901** represents one or more digital processors. In some example embodiments, the processor **901** may be configured through particularly configured hardware, such as an application specific integrated circuit (ASIC), field-programmable gate array (FPGA), etc., and/or through execution of software to perform functions in accordance with the disclosure herein. Network interface **918** may be implemented as one or both of a wired network interface and a wireless network (e.g., Wi-Fi, Internet, Bluetooth, etc.) interface, as is known in the art. Memory **902** represents one or more of volatile memory (e.g., RAM) and non-volatile memory (e.g., ROM, FLASH, magnetic media, optical media, etc.). Although shown within the apparatus computer **903**, memory **902** may be, at least in part, implemented as network storage that is external to the apparatus **800** and accessed via network interface **918**. The camera **914** may be a video camera or a still camera, and may comprise CMOS, CCD, and/or other imaging devices now known or subsequently developed.

Package receiver software **904** may be stored in a transitory or non-transitory portion of the memory **902**. Apparatus software **904** includes machine readable instructions that are executed by processor **901** to perform the functionality of the apparatus **800** as described herein. In embodiments, only a part of the apparatus software **904** may be housed in the memory **902**, whereas the remainder thereof may be housed elsewhere (e.g., on the cloud) or on another distributed network. In the illustrated example, the apparatus software **904** comprises a UAV verification module **906**, an energy harvesting module **908**, a thermal manager module **909**, a notification module **910**, a UAV guiding module **911**, an auto-leveling (or leveling) module **912**.

The package receiver computer **502** may be configured to communicate with an unmanned aerial vehicle **530**, and specifically the UAV computer **532** thereof (see FIG. **5**) when the unmanned aerial vehicle **530** is proximate (e.g., within twenty or so feet of) the collapsible package receiver **802**. The communication between the package receiver computer **903** and the unmanned aerial vehicle **530** may preferably be wireless communication. The package receiver computer **903** may also selectively communicate with the user **560** via the personal computer **562** of the user **560**. As discussed for apparatus **100**, the user **560** may, in

embodiments, download and install the package receiving application **572** into the memory **570** to interact with the apparatus **800**.

Example operation of the apparatus **800** will now be described with reference to FIGS. **8**A-E and **9**. The package receiver **802** may initially be in the closed position **802**C (FIG. **8**A). Assume, for example, that the user **560** orders (e.g., online or in-person) an item from the store and that the store apprises the user **560** that the item will be delivered to the user **560** two days thereafter. On the day of the delivery, the user **560** may place the package receiver **802** from the closed position **802**C (FIG. **8**A) to the open position **8020** (FIG. **8**B). For instance, the user **560** may decouple the stake **809** from the ground and pop-out the apparatus **802** (see FIG. **8**B). The user **560** may then use the elevating means **807** to elevate the package receiver **802** and place it in the package receiving position **802**R as shown in FIG. **8**C (e.g., the user **560** may place the receiver **802** in the package receiving position **802**R when he leaves his house for work).

In time, the unmanned aerial vehicle (such as an autonomous, semi-autonomous, or other unmanned aerial vehicle) may come proximate the apparatus **800** to deliver the package **814** to the package receiver **802**. For example, and as discussed above for apparatus **100**, the sender (or another, e.g., the owner or operator of the UAV **530**) may enter into the UAV software **542** the geographical location of the apparatus **800** associated with the recipient **560**, and the UAV **530** may employ same to travel to the apparatus **800**.

When the UAV **530** comes proximate (e.g., within twenty or so feet of) the apparatus **800** (e.g., the housing **822** thereof), the apparatus verification module **546** of the UAV software **542** (see FIG. **5**) may ensure that the package **814** being delivered is to be delivered to the particular apparatus **800**.

The apparatus verification module **546** (FIG. **5**) may employ the verification device **540** to verify that the package is being delivered to the intended apparatus **800**. For example, in an embodiment, each apparatus **800** may have a unique visible (or other) marker(s) **803**A (FIG. **8**C), and the verification device **540** may read or otherwise evaluate same to confirm that the package **814** is delivered to the intended apparatus **800**. The marker **803**A may be passive or active. For instance, the marker **803**A may be an LED or other light source that blinks at a particular frequency (which frequency may but need not be perceptible to the naked eye) and the verification device **540** may comprise a light sensor configured to read the light pattern to verify the particular apparatus **800**. Alternately or in addition, the marker **803**A may be a two or three dimensional symbol (such as a barcode, a target, cross-hairs, etc.). Or, for example, the marker **803**A may produce a unique sound and the UAV verification device **540** may include an audible sensor that is able to match said sound to the particular apparatus **800**. Or, for instance, the electronics **824** may include a beacon (e.g., an RFID, Bluetooth, or other beacon) and the UAV **530** may include a decoder that decodes the signal transmitted by the beacon to confirm the identity of the apparatus **800**.

In embodiments, the apparatus **800**, and specifically the UAV identification module **906** thereof, may likewise verify that the UAV **530** is an unmanned vehicle authorized to deliver packages to the apparatus **800**. In embodiments, once the apparatus **800** has verified the UAV **530**, a record of same may be stored at a remote location and/or in the memory **902** for posterity.

As discussed above for apparatus **100**, the UAV identification module **906** may identify the UAV **530** to ensure that the unmanned aerial vehicle is authorized to deliver a package to the package receiver **802** in one of any number of ways. In embodiments, the communication device **536** of the UAV may communicate a uniquely encoded signal to the apparatus **502**, and the signal, once received by the network interface **918**, may be decoded by the UAV verification module **906** to approve the delivery of the package by the unmanned aerial vehicle **530**. As discussed above for apparatus **100**, in some embodiments, the package receiver software **903** may include a gesture recognizer **522** that may function together with the camera **914** or other sensor to recognize a particular gesture made by the UAV **530** to authorize the delivery of the package thereby.

Once the apparatus verification module **546** of the UAV software **542** has verified the apparatus **800** and/or the UAV verification module **906** of the package receiver software **904** has verified the UAV **530**, the package drop off module **548** may cause the UAV to drop off the package(s) into the package receiving area **810** of the package receiver **802**. For example, the package holding apparatus of the UAV **530** may, in response to a communication by the package drop off module **548**, cause the package to be lowered (or otherwise dropped) into the package receiving area **810**.

The sensor **916** may be a machine code reader (e.g., a barcode scanner), a weight measuring sensor, or other sensor that allows the package receiver computer **903** to determine at least one characteristic of the package **814** dropped off into the package receiving area **810**. For example, in some embodiments, the package being dropped off the by UAV **530** may have a barcode or other machine readable indicia and the sensor **916** may read same so as to allow the notification module **910** to determine the contents of (or other information about) the package **814**. Alternately or additionally, the sensor **916** may determine the weight of the package and the notification module **910** may compare same to the expected weight of the package **814** that is to be delivered to the apparatus **800**. Such may provide further confidence that the appropriate package has now been delivered to the apparatus **800**. In addition, the sensor **916** may determine the weight of the package **814** to determine if two or more packages have been delivered to the apparatus **800**; and if so, the notification module **910** may communicate this information to the user **560** via the personal computer **562** of the user **560**. In some embodiments, the leveling module **912** may employ data from the sensors **916** (e.g., the weight sensors and associated actuators) to ensure that the package receiver **802** is appropriately leveled so as to not undesirably drop the package **814** onto the ground.

The notification module **910** may notify the user **560** that a package has been received in the package receiver **802**. For example, the notification module **910** may employ the network interface **918** to send the alert module **576** of the personal computer **562** a message outlining that the package has been received. The alert module **576** may, for example, ring, beep, vibrate, etc., to convey to the user **560** that a package has been delivered to the apparatus **800**. Alternately, the notification module **520** may send a text message, e-mail, voicemail, etc., to the user **560** to apprise the user of the delivery of the package **814**.

The user **560** may, in response to a notification by the notification module **520** (or otherwise), use the elevating means **807** (e.g., the rope **808**) to lower the package receiver **802**, as shown in FIG. **8**E. The user **560** may then access the package receiving area **810**, and specifically the cavity **812**, by unzipping (or otherwise unlatching) the openable section **815** and retrieve the package **814** from the package **814** receiver **802**.

Power to the apparatus **800**, e.g., to the package receiver computer **903** and its associated components, may be provided in one or more of any number of ways. In an embodiment, standard AC power from the building **10** may be used to the power the apparatus **800** (and the other apparatuses discussed above). In some embodiments, a rechargeable or other battery may be used to power the apparatus **800** (and the other apparatuses described above). Alternately or in addition, the apparatus **800** (and the other apparatuses above) may include an energy harvester **917** (such as solar cells or other energy harvesting devices) that is controlled by the energy harvesting module **908** to harvest energy and provide appropriate power to the apparatus **800**.

After the package (or packages) **814** has been retrieved by the user **560**, the user **560** may collapse the package receiver **802** again and place it in the closed position **802C**. If desired, the user **560** may further removably couple the package receiver **802** to the ground or other such surface until the next package delivery is due. The route optimizer **547** and the package analyzer **537** (of the UAV software **542**) may function as described above for the apparatus **100**. Similarly, the UAV guiding module **511**, the thermal manager **909**, the temperature control element **919**, etc., may function in line with the corresponding elements discussed above for apparatus **100**.

FIG. **13** shows an example process **1300** whereby the package receiving apparatus **800** receives the package **814** from the UAV **530**. The apparatus **800**, and specifically the package receiver **802** thereof, may initially be in the closed or stored position **802C** (FIG. **8A**).

At step **1302**, the user **560** expecting to receive the package **814** may pop-out the package receiver **802** (e.g., after removing the stake **809**, for example, as shown in FIG. **8B**). At step **1304**, the user **560** may use the elevating means **807** (e.g., the rope **808** and pulley **806**) to hoist the receiver **802** so that the UAV **530** may deposit the package **814** therein (see FIG. **8C**).

At step **1306**, the UAV **530** may use the flight path module **544** (and in embodiments, the route optimizer **547**) to fly from the location of the sender (or elsewhere) to a location proximate the apparatus **800**. At step **1308**, the UAV **530** may use the apparatus verification module **546** to authenticate the apparatus **100** and ensure that the package **814** is being delivered to the appropriate apparatus **800**. At step **1310** (which may, in embodiments, occur prior to step **1308**), the apparatus **800** may use the UAV verification module **906** to authenticate the UAV **530**.

At step **1312**, once the bidirectional authentication is complete, the UAV guiding module **911** may guide the UAV **530** to the apparatus **800** (e.g., guide the UAV **530** around any temporary or permanent obstacles in the path of the UAV **530**). At step **1314**, once the UAV **530** is properly aligned with the apparatus **100** so as to deposit the package **814** thereto, the package drop off module **548** may cause the UAV **530** to deposit the package **814** in the package receiving area **810** (e.g., cavity **812**) of the receiver **802**.

At step **1316**, the UAV **530** may use the sensor **916** to determine a characteristic C of the package **814** so that the same may be communicated to the user **560**. Alternately or in addition, and as discussed above, the UAV **530** may determine at least one characteristic C of the package **814** and communicate same to the package receiver computer **902**. At step **1318**, the receiver computer **902** may take an action based on the determined characteristic C. For example, where the UAV **530** determines via the sensor **916** and associated software (e.g., upon reading a barcode on the package **814**) that the package **814** contains pizza, the

thermal manager **909** of the package receiver software **904** may employ the temperature control element **919** to increase the temperature of the package receiving area **810** so as to keep the pizza warm. While not expressly shown in the flowchart on FIG. **13**, if desired, the leveling module **912** may cause the receiver **802** to become level or relatively level with the ground to ensure that the package **814** does not inadvertently fall onto the ground.

At step **1320**, the notification module **910** may wirelessly communicate with the personal computer **562** to notify the user **560** that the package **814** has been received in the package receiver **802**. For instance, the notification module **910** of the receiver **802** may cause the alert module **576** of the personal computer **562** to generate an alert (e.g., a ring) to apprise the user **560** of the delivery of the package **814**.

At step **1322**, the user **560** may use the elevating means **807** to lower the package receiver **802**. The user **560** may then at step **1324** open the openable section **815** and retrieve the package **814**. The user **560** may then collapse the package receiver **802** as shown in FIG. **8A** for storage at step **1326**. If desired, at step **1328**, the user **560** may use the rating module **577** to rate the package **814** and/or the delivery thereof by the UAV **530**. The method **1300** may then end until the next package deliver is due.

Attention is directed now to FIG. **10**, which shows an alternate embodiment **1000** of the package receiving apparatus **800**. The package receiving apparatus **1000** may be similar to the package receiving apparatus **800**, except as specifically noted and/or shown, or as would be inherent. Further, those skilled in the art will appreciate that the apparatus **800** (and thus the apparatus **1000**) may be modified in various ways, such as through incorporating all or part of any of the various described embodiments, for example. For uniformity and brevity, corresponding reference numbers may be used to indicate corresponding parts, though with any noted deviations.

A primary difference between the apparatus **800** and the apparatus **1000** may be that unlike the elevating means **807** (e.g., the rope **808** and pulley **806** or other elevating means), the apparatus **1000** may employ a pole **1004** to which a package receiver **1002** is movably coupled. The package receiver **1002** may be a basket, a tray, the package receiver **802**, or any other container configured to receive a package.

In more detail, the pole **1004** may have a movable arm **1006** to which the package receiver **1002** is coupled. The movable arm **1006**, akin to a flag, may be caused to be raised and lowered along the pole **1004** (using a rope, for example, or automatically via rollers other means). The arm **1006** may, in its initial position, be proximate the ground (or other such) surface. When the user **560** expects a package delivery, the user **560** may raise the movable arm **1006** along the pole **1004** to elevate the package receiver **1002** (or alternately, machine controllable wheels etc., may be provided that allow the receiver **1002** to be elevated for receiving a package). The UAV **530** may deliver the package **814** to the package receiver **1002**, and the user **560** may thereafter lower the receiver **1002** along the pole **1004** and retrieve the package **814**. As discussed above for other embodiments, the package receiver **1002** may include one or more sensors and associated software that allow the recipient and/or the UAV **530** to desirably communicate with the apparatus **1000**. The pole **1004** may be a free standing pole or may be coupled to the building **10**. In embodiments, the window receiving apparatus (e.g., an awning, a basket or other container, etc.) may be disposed on a traditional flag pole.

Focus is directed now to FIGS. **11A-11B**, which show an alternate embodiment **1100** of the package receiving appa-

ratus **1000**. The package receiving apparatus **1100** may be similar to the package receiving apparatus **1000**, except as specifically noted and/or shown, or as would be inherent. Further, those skilled in the art will appreciate that the apparatus **1000** (and thus the apparatus **1100**) may be modified in various ways, such as through incorporating all or part of any of the various described embodiments, for example. For uniformity and brevity, corresponding reference numbers may be used to indicate corresponding parts, though with any noted deviations.

The package receiving apparatus **1100** is shown in FIG. **11**A in a package receiving position **1100**P, and in shown in FIG. **11**B in a package delivery position **1100**D. The package receiving apparatus **1100** may include a movable arm **1104**. The arm **104** may have a proximal side **1104**P proximate the window **12** and a distal side **1104**D further away from the window **12**. The arm **1104** may be pivotably coupled to the building **10**, such as above the window **12** or elsewhere. Specifically, the arm **1104**, at its proximal side **1104**P, may be rotatably coupled to the building via a hinge **1105**. The apparatus **1110** may include electronics as discussed above for other embodiments, and the arm **1104** may be controlled by these electronics (e.g., a motor, actuator, etc.). At its distal side **1104**D, the arm **1104** may have pivotably coupled thereto a self-leveling basket (or other container) **1120** via a hinge **1106**.

In more detail, in the package receiving position **1100**P, the electronics may cause the arm **1104** to be raised above the window **12** to receive a package from the UAV **530**. In this configuration, the arm distal side **1104**D, in the vertical plane, may be higher than the arm proximal side **1104**P, and the arm **1104** may make an angle **1112** with the vertical plane. The UAV **530** may drop off the package in the self-leveling basket **1120**. If the UAV **530** drops the package in one side of the basket **1120** (e.g., on the left side or the right side, as opposed to in the center of the basket), the basket **1120** may automatically level itself (i.e., become generally parallel to the ground surface) to ensure that the package is securely retained therein. For example, the electronics may cause the hinge **1106** to rotate in a clockwise or counterclockwise direction as desired to cause the basket **1120** to become generally level with the ground surface.

When the user **560** wishes to retrieve the package **814**, he may use the personal computer **562**, e.g., an application downloaded thereon, to cause the arm **1104** to be lowered. Specifically, the user **560** may cause the arm **1104** to rotate in a clockwise direction such that the arm distal side **1104**D is now below the arm proximal side **1104**P in the vertical plane. In this package delivery configuration **1110**D, the arm **1104** may make an angle **1113** with the vertical plane, which may be smaller than the angle **1112**. In embodiments, the angle **1112** may be an obtuse angle (e.g., 130 degrees) and the angle **1113** may be an acute angle (e.g., 30 degrees).

The arm **1104** may be configured such that in the package delivery position **1100**D the basket **1120** is proximate (e.g., outwardly adjacent) the window **12** and accessible therefrom. The user **560** may open the window **12** to access the basket **1120** and retrieve the package **814**. The apparatus **1100** may then automatically, or on user command, go back to the package receiving position **1110**P so that the view from the window **12** is largely unobstructed.

Attention is directed now to FIG. **12**, which show yet another alternate embodiment **1200** of the package receiving apparatus **1000**. The package receiving apparatus **1200** may be similar to the package receiving apparatus **1000**, except as specifically noted and/or shown, or as would be inherent. Further, those skilled in the art will appreciate that the

apparatus **1000** (and thus the apparatus **1200**) may be modified in various ways, such as through incorporating all or part of any of the various described embodiments, for example. For uniformity and brevity, corresponding reference numbers may be used to indicate corresponding parts, though with any noted deviations.

All the apparatuses discussed above are configured to receive packages from unmanned aerial vehicles. The package receiving apparatus **1200**, conversely, may be configured to receive packages from unmanned vehicles that travel on the ground. The package receiving apparatus **1200** may be configured on a door **1202** of the building **10**. For example, akin to a pet door, the apparatus **1200** may comprise a slidable panel **1206** configured at a bottom side of the door **1202**. The panel **1206** may have associated therewith electronics as discussed above, such as sensors (e.g., a weight sensor), communication devices (e.g., an RFID, Bluetooth, or Wi-Fi device to communicate with the unmanned vehicle and/or the recipient upon delivery of the package), actuators (e.g., a motor to open the panel **1206** so that the package can be deposited inside the building through the panel **1206**, and to close the panel **1206** once the delivery has been made), etc.

In some embodiments, instead of being configured on the door **1202** of the building **10**, the package receiving apparatus **1200** may be configured elsewhere proximate the building **12** (e.g., in a dog house or in another structure (e.g., a dedicated structure)) proximate the building **10** and may be adapted to receive and secure packages delivered by unmanned vehicles. In embodiments, the door **1202** may be a garage door, a storm door (or window), or other such structure.

The unmanned vehicle carrying the package may come proximate the apparatus **1200**. Communication, which may be bidirectional, may then be effectuated to confirm that the package is to be delivered to the particular apparatus **1200**. For example, as discussed above for other embodiments, the apparatus **1200** may include flashing lights that flash at a unique frequency and the unmanned vehicle may evaluate this signal to confirm that the package is to be delivered to the apparatus **1200**. Once the authentication is complete, the panel **1206** may automatically slide open (e.g., outwards) to allow the unmanned vehicle to deliver a package through the opening created by the slidable panel **1206**. When the delivery is complete, the panel **1206** may close to secure the package within the building **10**. In embodiments, and as discussed above for other apparatuses, the apparatus **1200** may apprise the user **560** via his personal computer **562** that the package **814** has been delivered.

The disclosure above focuses, in general, on unmanned vehicles that travel in the air or on land. The skilled artisan will appreciate, however, that the disclosure is not so limited, and that other unmanned vehicles (e.g., unmanned vehicles that travel on or under water, unmanned vehicles configured to or capable of traveling in vacuum or other gas filled areas, unmanned vehicles that can travel both on land and on/in water, etc.) may likewise be employed. For example, in an embodiment, an unmanned vehicle may be used to deliver a package or other item (e.g., a drink) to a user on a lake, a deck, a hot-tub, a backyard, a pool, etc. In some embodiments, the unmanned vehicle may communicate with an electronic device (e.g., a cell phone) uniquely associated with a user and use same to locate and deliver an item (e.g., a snack) directly to the user.

Many different arrangements of the various components depicted, as well as components not shown, are possible without departing from the spirit and scope of the present

disclosure. Embodiments of the present disclosure have been described with the intent to be illustrative rather than restrictive. Alternative embodiments will become apparent to those skilled in the art that do not depart from its scope. A skilled artisan may develop alternative means of implementing the aforementioned improvements without departing from the scope of the present disclosure.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations and are contemplated within the scope of the claims. Not all steps listed in the various figures need be carried out in the specific order described.

The disclosure claimed is:

1. An apparatus for receiving a package delivered by an unmanned aerial vehicle, comprising:
   a collapsible package receiver configured to be placed from a collapsed position to a pop-out position to receive said package from said unmanned aerial vehicle;
   an elevating mechanism movably coupling said collapsible package receiver to a building;
   a memory associated with said package receiver and storing computer-readable instructions; and
   a processor configured to execute said instructions to:
      determine a characteristic of said package delivered by said unmanned aerial vehicle to said package receiver; and
      notify a user of the delivery of said package;
   wherein, said collapsible package receiver is configured to be removably secured to a ground surface in said collapsed position.

2. The apparatus of claim 1, wherein said package receiver is movably coupled to a gutter of said building.

3. The apparatus of claim 1, further comprising a mobile device to receive an alert when said package is delivered to said package receiver.

4. The apparatus of claim 1, wherein said package receiver contains at least one opening to drain rainwater from a package receiving cavity of said package receiver.

5. The apparatus of claim 1, wherein said package receiver includes an openable section for retrieving said package.

6. The apparatus of claim 1, wherein said package receiver includes a marker adapted to be evaluated by said unmanned aerial vehicle.

7. The apparatus of claim 6, wherein said processor is configured to execute said instructions to wirelessly communicate with said unmanned aerial vehicle when said unmanned aerial vehicle is proximate said package receiver.

8. A package receiver system for receiving a package delivered by an unmanned aerial vehicle, comprising:
   a collapsible package receiver comprising a processor and a memory including instructions; said collapsible package receiver configured to be selectively placed in a collapsed position for storage and an expanded position for receiving said package; and
   an elevating mechanism comprising a rope; said collapsible package receiver being movably coupled to a building via said rope;
   wherein:
   said collapsible package receiver is configured to be: (a) placed in said expanded position from said collapsed position and raised along said rope to receive said package delivered by said unmanned aerial vehicle; (b)

lowered along said rope after said package is delivered to allow for said package to be retrieved from said collapsible package receiver; and (c) placed in said collapsed position from said expanded position after said package is retrieved;
   said processor is configured to execute said instructions to notify a user of said delivery of said package;
   said collapsible package receiver is configured to be removably secured to a ground surface in said collapsed position.

9. The package receiver system of claim 8, wherein said elevating mechanism comprises a pulley.

10. The package receiver system of claim 8, wherein said collapsible package receiver includes a zipper, said zipper being configured to be opened for said retrieval of said package.

11. The package receiver system of claim 8, wherein said collapsible package receiver comprises a marker configured to be used by said unmanned aerial vehicle to confirm an identity of said collapsible package receiver.

12. The package receiver system of claim 11, wherein said marker comprises an audible marker and a visible marker.

13. The package receiver system of claim 12, wherein said visible marker comprises lights configured to blink at a predetermined frequency.

14. The package receiver system of claim 8, wherein said collapsible package receiver comprises a gesture recognizer configured to recognize a movement pattern of said unmanned aerial vehicle.

15. The package receiver system of claim 8, wherein said rope is coupled to a gutter of said building.

16. The package receiver system of claim 15, wherein said rope is further coupled to a hook at a foot of said building.

17. A package receiver system for receiving a package delivered by an unmanned aerial vehicle, comprising:
   a foldable package receiver comprising a processor and a memory having instructions; said foldable package receiver configured to be selectively placed in a folded position for storage and an expanded position for receiving said package; and
   an elevating mechanism movably coupling said foldable package receiver to a building; said elevating mechanism being configured to allow said foldable package receiver to be raised after said package receiver is placed from said folded position to said expanded position to receive said package from said unmanned aerial vehicle;
   wherein:
   said processor is configured to execute said instructions to determine a characteristic of said package received by said foldable package receiver;
   said foldable package receiver is configured to be removably secured to a ground surface in said folded position.

18. The package receiver system of claim 17, further comprising a marker configured to be used by said unmanned aerial vehicle to verify a characteristic of said collapsible package receiver.

19. The package receiver system of claim 18, wherein said marker includes each of a visible marker and an audible marker.

20. The package receiver system of claim 17, wherein said foldable package receiver includes an opening configured to drain rainwater from a package receiving cavity of said foldable package receiver.

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